United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the South Dakota Agricultural Experiment Station

Soil Survey of Hamlin County, South Dakota

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How To Use This Soil Survey

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

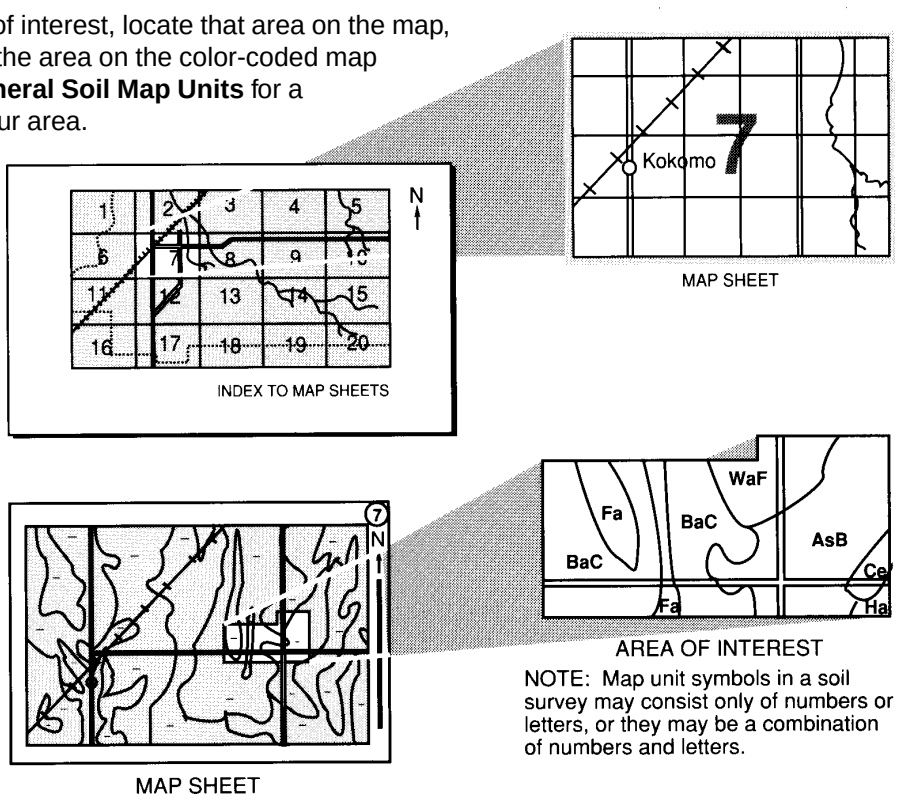
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.



The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service, formerly the Soil Conservation Service, has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service and the South Dakota Agricultural Experiment Station. It is part of the technical assistance furnished to the Hamlin County Conservation District. Some financial assistance was furnished by the Hamlin County Conservation District.

Cover: Hayland in an area of Lamoure silty clay loam. Divide loam is in the background.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Issued 2002

Foreword

This soil survey contains information that can be used in land-planning programs in Hamlin County, South Dakota. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for optimum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too stony to be cultivated. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Dean F. Fisher
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Hamlin County, South Dakota

By Bruce O. Kunze and C. Howard Wiesner, Natural Resources Conservation Service

Soils surveyed by C. Howard Wiesner, Kenneth F. Miller, Wayne J. Bachman, Mary Lou Woolf, Kent E. Cooley, and Bruce O. Kunze, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the South Dakota Agricultural Experiment Station

HAMLIN COUNTY is in northeastern South Dakota (fig. 1). It has a total land area of 344,448 acres, or about 540 square miles. About 4,440 acres is state-owned land, which includes school lands, roads, and lands owned by the Department of Game, Fish, and Parks.

According to the 1990 census, Hamlin County has a population of 4,974 (South Dakota Agricultural Statistics Service, 1992). Hayti (population 372) is the county seat. Other communities include Bryant (population 374), Castlewood (population 549), Dempster (population 75), Estelline (population 658), Hazel (population 103), and Lake Norden (population 342).

About 70 percent of the acreage in the county is cropland (U.S. Department of Commerce, 1987), 13 percent is pasture and hayland (USDA, 1987), and 9 percent is rangeland (USDA, 1987). Corn, oats, wheat, soybeans, and alfalfa are the main crops. Farming is diversified. Livestock and livestock products are the main sources of income in the county, but income from cash crops also is important.

General Nature of the County

This section provides general information about Hamlin County. It describes climate; physiography, relief, and drainage; settlement; farming; and natural resources.

Climate

Hamlin County is cold in winter and is quite hot with occasional cool spells in summer. Precipitation during the winter frequently occurs as snowstorms. During the warm months precipitation occurs chiefly as showers after warm, moist air moves in from the south. Total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Castlewood, South Dakota, in the period 1961 to 1990. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 15 degrees F and the average daily minimum temperature is 4 degrees. The lowest temperature on record, which occurred at Castlewood on February 28, 1962, is -40 degrees. In summer the average temperature is 70 degrees. The highest recorded temperature, which occurred on July 10, 1966, is 107 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

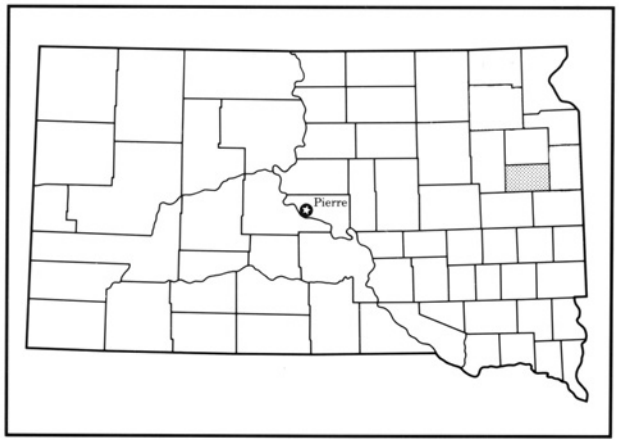

Figure 1.—Location of Hamlin County in South Dakota.

The total annual precipitation is about 23 inches. Of this, about 17 inches, or 75 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.25 inches at Castlewood on July 13, 1966. Thunderstorms occur on about 40 days each year, and most occur in July.

The average seasonal snowfall is 27 inches. The greatest snow depth at any one time during the period of record was 32 inches. On the average, 12 days per year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year. The heaviest 1-day snowfall on record was 32 inches.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 75 percent of the time possible in summer and 57 percent in winter. The prevailing wind is from the south-southeast in the summer and from the northwest in the winter. Average windspeed is highest, 13 miles per hour, in March.

Physiography, Relief, and Drainage

Hamlin County is in the highlands known as the Coteau des Prairies. The Prairie Coteau generally is gently sloping to moderately sloping, but slopes are moderately steep or steep along drainageways and breaks to large drainage valleys. The general flow of water in the county is from north to south. The Big Sioux River, in the eastern part of the county, enters the county at the northern border and flows out at the extreme southeast corner. Stray Horse Creek and Hidewood Creek are in the eastern part of the county. They flow to the southwest and empty into the Big Sioux River. The extreme southwest part of the county is drained by Dolph Creek, which flows east into Lake Norden. The western part of the county is locally drained into many wetlands. For example, when one wetland in the northwestern part of the county overflows, it drains into another wetland and eventually ends up in Lake Marsh. When Lake Marsh overflows, it drains into Lake Norden, down through four more lakes, and into the Big Sioux River (Kume, 1976).

Elevation ranges from about 1,640 to 1,952 feet above sea level. The lowest elevation is south of Estelline in the extreme southeast corner of the county. The highest elevation is on the Hamlin County line in the extreme northeast part of the county.

Settlement

Hamlin County was named in honor of Hannibal Hamlin, Vice President of the United States during the term of Abraham Lincoln. The county was established by the Dakota Territorial Legislation in 1873 from parts of Deuel and Hanson Counties. The first county boundaries included the southern part of Codington County. Hamlin County assumed its present-day boundaries in 1877, when Codington County was formed. The county was officially organized in August 1878 (South Dakota Crop and Livestock Reporting Service, 1968).

The first homesteader in the area arrived in 1876. The Chicago and Northwestern Railroad was established in the eastern part of the county in 1882. Estelline, Dempster, and Castlewood are served by this railroad.

The town of Dempster was started as a shipping site in 1882. Castlewood was established in the fall of 1882, and Estelline was established in 1883.

The settlement of the county continued at a rapid pace; the eastern part was settled first. Railroads had crossed the southwestern and northwestern parts of the county by 1887.

Railroads served the county from 1882 to 1970. U.S. Highway 81 and South Dakota Highways 28 and 21 are the main highways. Interstate 29 crosses the northeast corner of the county. Most rural areas are served by all-weather roads to centers of trade.

Farming

Farming is the principal enterprise in Hamlin County. About 57 percent of the farm income is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). The rest is derived mainly from the sale of small grain and corn. Some of the crops are used as feed for livestock.

There were 501 farms in Hamlin County in 1987. The average farm size was 566 acres (U.S. Department of Commerce, 1987). The general trend is toward fewer and larger farms.

Approximately 70 percent of the total acreage in the county is used for cultivated crops, and less than 13 percent is used for tame pasture and hay. Dryland farming is dominant, but about 4,700 acres was irrigated in 1991 (South Dakota Agricultural Statistics Service, 1992). Nearly all irrigation is by sprinkler systems. The main cropping system is a sequence of row crops, small grain, and alfalfa. Corn, oats, wheat, and soybeans are the main cultivated crops. Alfalfa, intermediate wheatgrass, and smooth bromegrass are the main crops grown for hay. In 1991, corn was grown on 84,500 acres; soybeans on 63,900 acres; wheat on 34,500 acres; oats on 13,400 acres; and barley on 4,100 acres. The corn from 79,900 acres was harvested for grain. The rest was used for silage (South Dakota Agricultural Statistics Service, 1992).

The Hamlin County Soil Conservation District was organized in 1945. It has been instrumental in planting grass and trees and applying other conservation practices to help control erosion. The trees also provide protection for farmsteads and habitat for wildlife.

Natural Resources

Soil is the most important natural resource in Hamlin County. It provides a growing medium for crops and for the grasses grazed by livestock. Other natural resources are water, sand and gravel, and wildlife.

The underground aquifers are excellent sources of water for domestic and industrial uses and for irrigation. Many enclosed basins, dugouts, and larger creeks provide water for livestock and wildlife. The principal source of water for domestic use and for livestock is shallow wells. Because some areas do not have a source of shallow water, rural water is piped throughout the county. This water is provided by underground aquifer. The many lakes provide fishing and recreation.

The principal surface-water resources are the Big Sioux River and its tributaries and many wetland areas and natural lakes. Surface water is used mainly for watering livestock and wildlife and for recreation.

Deposits of sand and gravel are extensive in Hamlin County. Sand and gravel are used mainly in road construction. Because of the large content of silts and fine sands, most of these deposits generally are unsuitable as construction material and concrete aggregate, but they are suitable for subgrade material for roads.

Wildlife in the county includes white-tailed deer and upland game birds, such as pheasant and Hungarian partridge. Bass, bluegill, northern pike, perch, walleye, and other fish species are in the lakes and rivers. The many wetland areas provide habitat for waterfowl.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; and the kinds of crops and native plants growing on the soils. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to

identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map in this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the associations are in different landform positions (fig. 2). These landform positions affect such characteristics as the amount of topsoil, the drainage class, the runoff rate, and the content of organic matter.

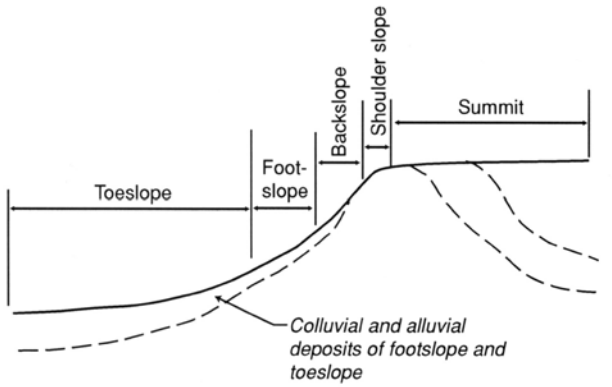

Figure 2.—Landform positions.

1. Poinsett-Waubay-Buse Association

Well drained and moderately well drained, nearly level to hilly, silty and loamy soils; on till plains and moraines

This association is characterized by smooth slopes and scattered basins. Slopes generally are nearly level to gently rolling, but they are steep along some drainageways and basins. The drainage pattern is fairly well defined. Drainageways typically terminate in lakes or large basins.

This association makes up about 65 percent of the county. It is about 55 percent Poinsett soils, 10 percent Waubay soils, 10 percent Buse soils, and 25 percent soils of minor extent (fig. 3).

The well drained Poinsett soils are on summits and backslopes. Slopes range from 0 to 15 percent but typically are 0 to 9 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is grayish brown and light yellowish brown silty clay loam and silt loam. It is calcareous in the lower part. The underlying material is light yellowish brown and light gray, mottled, calcareous silt loam and loam.

The moderately well drained Waubay soils are on footslopes. Slopes range from 0 to 6 percent. Typically, the surface soil is dark gray silty clay loam. The subsoil is dark grayish brown, brown, and light yellowish brown silty clay loam and silt loam. It is calcareous in the lower part. The underlying material is pale yellow, mottled, calcareous silt loam.

The well drained Buse soils are on shoulder slopes. Slopes typically range from 3 to 25 percent, but they range to 40 percent in some places. Typically, the surface layer is grayish brown, calcareous loam. The subsoil is light gray, calcareous loam. The underlying material is light yellowish brown, calcareous loam.

Of minor extent in this association are Badger, Barnes, Cubden, Oldham, Parnell, Southam, and Tonka soils and areas of water. The somewhat poorly drained Badger soils are on toeslopes. The well drained Barnes soils contain more sand and less silt than the Poinsett and Waubay soils. They are on summits and backslopes. The somewhat poorly drained, calcareous Cubden soils are on footslopes. The poorly drained Tonka and very poorly drained Oldham, Parnell, and Southam soils are in basins.

About 65 percent of this association is cropland. The main crops are corn, soybeans, small grain, and

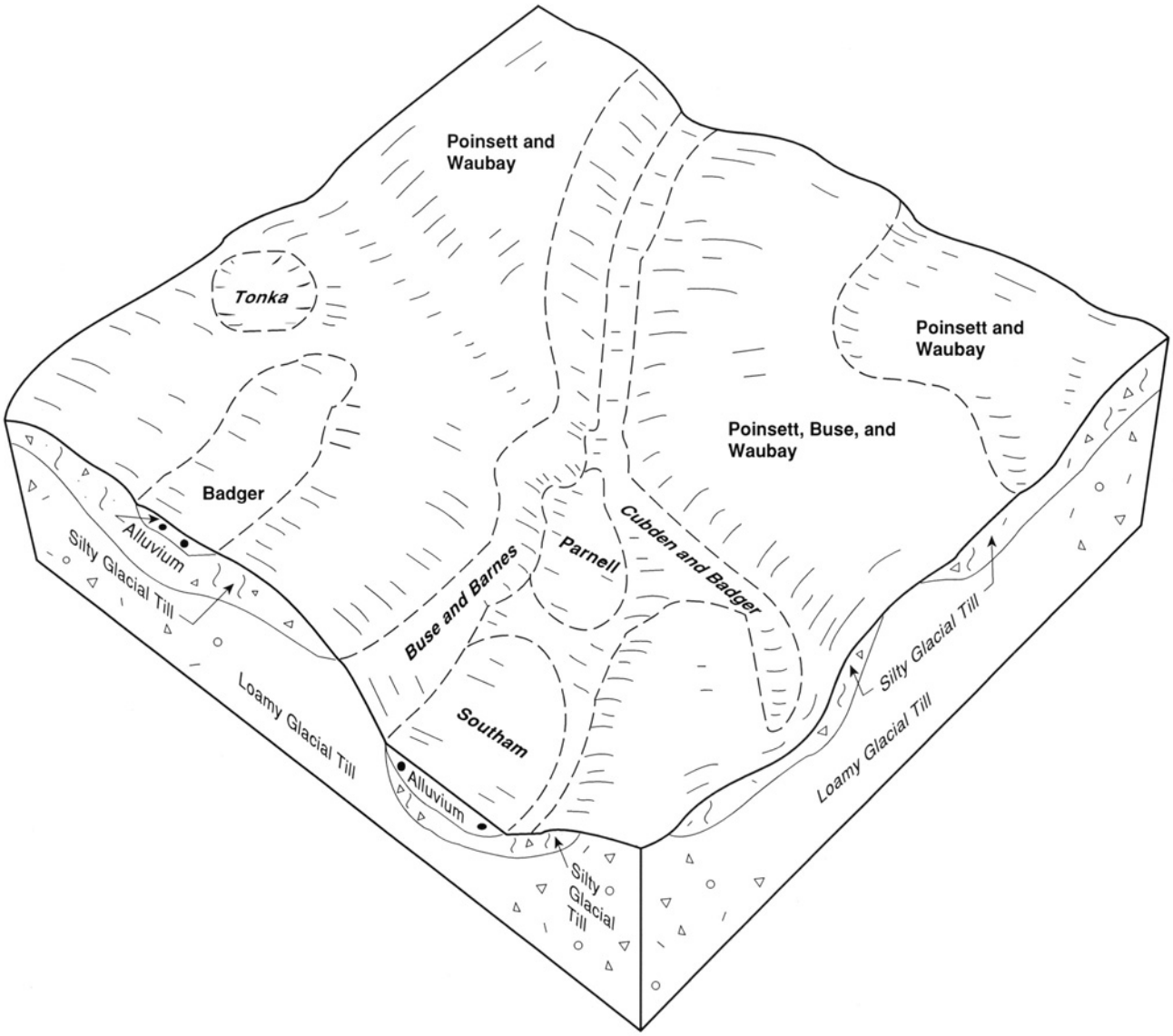

Figure 3.—Typical pattern of soils and underlying material in the Poinsett-Waubay-Buse association.

alfalfa. A few of the steeper areas are used for range. Controlling erosion is the main management concern in cropped areas that have slopes of more than 2 percent. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

2. Kranzburg-Brookings Association

Well drained and moderately well drained, nearly level and gently sloping, silty soils; on till plains

This association is characterized by gentle rises that have long, smooth slopes leading to swales and shallow drainageways. The drainage pattern is well defined. Slopes generally are nearly level and gently sloping but are moderately sloping in a few places.

This association makes up about 5 percent of the county. It is about 41 percent Kranzburg and similar soils, 25 percent Brookings and similar soils, and 34 percent soils of minor extent (fig. 4).

The well drained Kranzburg soils are on summits and backslopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is dark brown and brown silty clay loam in the upper part and light yellowish brown, calcareous

clay loam in the lower part. The underlying material is light brownish gray, mottled, calcareous clay loam.

The moderately well drained Brookings soils are on footslopes. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray silty clay loam. The subsoil is dark gray silty clay loam and light brownish gray, calcareous silty clay loam in the upper part. It is light gray, calcareous clay loam in the lower part. The underlying material is pale yellow, mottled, calcareous clay loam.

Of minor extent in this association are Brandt, Buse, Estelline, Fordville, LaDelle, Lamoure, McIntosh, Renshaw, Sioux, and Vienna soils. The well drained Brandt soils formed in silty material over gravelly material. They are on summits and backslopes. The well drained, calcareous Buse soils have more sand and less silt than the major soils. They are on shoulder slopes along drainageways. The well drained Estelline and Fordville soils are underlain by gravelly material. They are on backslopes and footslopes. The moderately well drained LaDelle soils are on high flood plains, and the poorly drained Lamoure soils are on low flood plains. The somewhat poorly drained, calcareous McIntosh soils are on footslopes. Renshaw and Sioux soils are underlain by gravelly material. The somewhat excessively drained Renshaw soils are on backslopes, and the excessively drained Sioux soils are on shoulder slopes. The well drained Vienna soils have a thinner layer of silty material over glacial till than the Kranzburg and Brookings soils. They are in positions on the landscape similar to those of the Kranzburg soils.

About 90 percent of this association is cropland. Corn, soybeans, small grain, and alfalfa are the main crops. The steeper areas along the larger drainageways support native grasses and are used as rangeland. Controlling erosion is the main management concern in cropped areas that have slopes of more than 2 percent. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

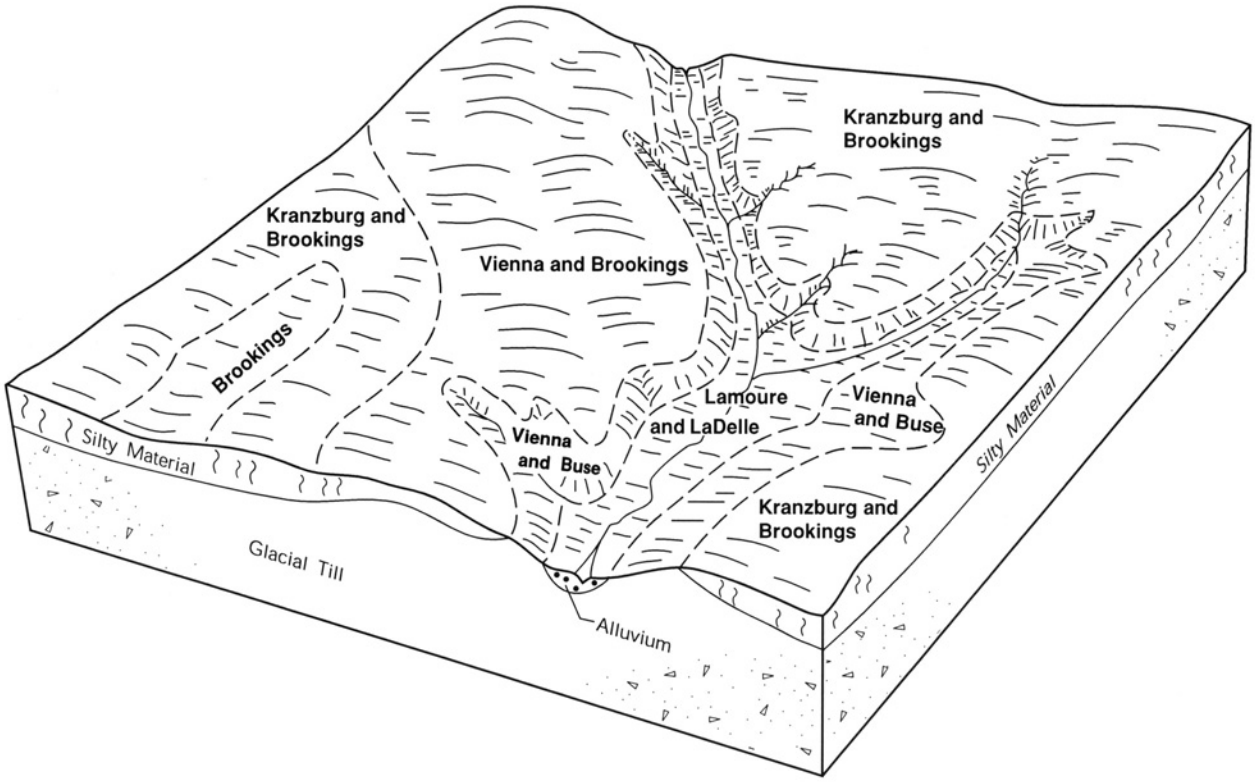

Figure 4.—Typical pattern of soils and underlying material in the Kranzburg-Brookings association.

3. Vienna-Brookings Association

Well drained and moderately well drained, nearly level to moderately sloping, silty soils; on till plains and moraines

This association is characterized by gentle rises that have long, smooth slopes leading to small drainageways. The drainage pattern is well defined in most areas. Slopes generally are nearly level and gently sloping but are moderately sloping in some places.

This association makes up about 10 percent of the county. It is about 53 percent Vienna soils, 22 percent Brookings soils, and 25 percent soils of minor extent.

The well drained Vienna soils are on summits and backslopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is dark gray silty clay loam. The subsoil is dark grayish brown silty clay loam in the upper part and grayish brown, light yellowish brown, and pale yellow clay loam in the lower part. It is calcareous in the lower part. The underlying material is pale yellow, mottled, calcareous clay loam.

The moderately well drained Brookings soils are on footslopes. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray silty clay loam. The subsoil is dark gray silty clay loam and light brownish gray, calcareous silty clay loam in the upper part. It is light gray, calcareous clay loam in the lower part. The underlying material is pale yellow, mottled, calcareous clay loam.

Of minor extent in this association are Barnes, Buse, Divide, Estelline, Fordville, Kranzburg, Lamoure, McIntosh, Poinsett, Renshaw, and Sioux soils. The well drained Barnes soils have more sand and less silt in the subsoil than the Vienna soils. They are in landscape positions similar to those of the Vienna soils. The well drained, calcareous Buse soils have more sand and less silt in the surface layer and subsoil than the major soils. They are on shoulder slopes. The somewhat poorly drained Divide soils are underlain by gravelly material. They are on high flood plains. The well drained Estelline and Fordville soils are underlain by gravelly material. They are on backslopes and footslopes. The well drained Kranzburg soils have a thicker layer of silty material over glacial till than the Vienna soils. They are in positions on the landscape similar to those of the Vienna soils. The somewhat poorly drained and poorly drained Lamoure soils are on low flood plains. The somewhat poorly drained, calcareous McIntosh soils are on footslopes. The well drained Poinsett soils have a silty underlying layer. They are in landscape positions similar to those of the Vienna soils. Renshaw and Sioux soils are underlain by gravelly material. The somewhat excessively drained Renshaw soils are on backslopes, and the excessively drained Sioux soils are on shoulder slopes.

About 80 percent of this association is cropland. Corn, soybeans, small grain, and alfalfa are the main crops. Controlling water erosion is the main management concern in cropped areas that have slopes of more than 2 percent. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

4. Barnes-Vienna-Buse Association

Well drained, nearly level to strongly sloping, loamy and silty soils; on till plains and moraines

This association is characterized by gentle rises and long, smooth slopes that lead to small drainageways. In most areas the drainage pattern is well defined. Slopes generally are nearly level and gently sloping but are moderately sloping to steep in some places.

This association makes up about 1 percent of the county. It is about 32 percent Barnes soils, 19 percent Vienna soils, 14 percent Buse soils, and 35 percent soils of minor extent.

Barnes soils are on summits and backslopes. Slopes range from 0 to 15 percent but typically are 0 to 9 percent. Typically, the surface layer is dark gray loam. The subsoil is brown and light yellowish brown clay loam. It is calcareous in the lower part. The underlying material is light yellowish brown, calcareous clay loam.

Vienna soils are on summits and backslopes. Slopes range from 0 to 9 percent. Typically, the surface layer is dark gray silt loam. The subsurface layer is dark gray silty clay loam. The subsoil is dark grayish brown silty clay loam in the upper part and grayish brown, light yellowish brown, and pale yellow clay loam in the lower part. It is calcareous in the lower part. The underlying material is pale yellow, mottled, calcareous clay loam.

Buse soils are on shoulder slopes. Slopes typically range from 3 to 15 percent, but in some places they range from 3 to 40 percent. Typically, the surface layer is grayish brown, calcareous loam. The subsoil is light gray, calcareous loam. The underlying material is light yellowish brown, calcareous loam.

Of minor extent in this association are Brookings, Egeland, Fordville, Kranzburg, Lamoure, McIntosh, Renshaw, and Sioux soils. The moderately well drained Brookings soils are on footslopes. The well drained Egeland soils contain more sand than the

major soils. Fordville soils are underlain by gravelly material. Egeland and Fordville soils are in positions on the landscape similar to those of the Barnes and Vienna soils. The well drained Kranzburg soils have a thicker layer of silty material over glacial till than the Vienna soils. They are in positions on the landscape similar to those of the Vienna soils. The somewhat poorly drained and poorly drained Lamoure soils are on low flood plains. The somewhat poorly drained McIntosh soils are on footslopes. The somewhat excessively drained Renshaw soils are on backslopes, and the excessively drained Sioux soils are on shoulder slopes.

About 80 percent of this association is cropland. Corn, soybeans, small grain, and alfalfa are the main crops. The steeper areas and the larger drainageways support native grass and are used for grazing. Controlling water erosion is the main management concern in cropped areas that have slopes of more than 2 percent. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

5. Brandt-Estelline Association

Well drained, nearly level and gently sloping, silty soils that are underlain by gravelly material; on outwash plains

This association is characterized by broad flats that have long, smooth slopes. The drainage pattern is well defined in most areas.

This association makes up about 9 percent of the county. It is about 38 percent Brandt and similar soils, 26 percent Estelline and similar soils, and 36 percent soils of minor extent.

Brandt soils are on summits and backslopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silty clay loam. The subsoil is dark grayish brown, brown, and yellowish brown silty clay loam and silt loam in the upper part and light yellowish brown, calcareous silt loam and gravelly loam in the lower part. The underlying material is pale yellow, calcareous gravelly loamy sand.

Estelline soils are on summits and backslopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray silt loam. The subsoil is dark grayish brown and light olive brown loam in the upper part and light yellowish brown, calcareous loam and gravelly sandy loam in the lower part. The underlying material is light yellowish brown and pale brown, calcareous gravelly sandy loam, gravelly loamy sand, and sand.

Of minor extent in this association are Brookings, Cubden, Egeland, Fordville, Kranzburg, Lamoure, Poinsett, Rauville, Renshaw, Sioux, and Southam soils. The moderately well drained Brookings soils are on footslopes. The somewhat poorly drained, calcareous Cubden soils are also on footslopes. Egeland soils formed in loamy glaciofluvial sediments. They are in the higher positions on the landscape. Fordville soils have more sand and less silt than the Estelline soils and are underlain by gravelly material. Fordville soils are in landscape positions similar to those of the major soils. The well drained Kranzburg soils formed in silty material overlying loamy material. They are on backslopes on till plains. The somewhat poorly drained and poorly drained Lamoure soils and the very poorly drained Rauville soils are on low flood plains. The well drained Poinsett soils are not underlain by gravelly material. They are on summits and backslopes on till plains. Renshaw and Sioux soils are underlain by gravelly material. The somewhat excessively drained Renshaw soils are on backslopes, and the excessively drained Sioux soils are on shoulder slopes. The very poorly drained Southam soils are in basins.

About 80 percent of this association is cropland. Corn, soybeans, small grain, and alfalfa are the main crops. Some areas are irrigated. A few of the steeper areas are used for grazing. In cultivated areas, conserving moisture and controlling water erosion where slopes are more than 2 percent are important management concerns. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

6. Renshaw-Fordville Association

Somewhat excessively drained and well drained, nearly level to strongly sloping, loamy soils that are underlain by gravelly material; on outwash plains and moraines

This association is characterized by large flats and smooth slopes in the nearly level areas, but slopes are more complex in the sloping areas. The drainage pattern is well defined.

This association makes up about 6 percent of the county. It is about 40 percent Renshaw and similar soils, 25 percent Fordville and similar soils, and 35 percent soils of minor extent (fig. 5).

The somewhat excessively drained Renshaw soils are on summits and backslopes. Slopes range from 0 to 15 percent but typically are 0 to 9 percent. Typically, the surface soil is dark gray loam. The subsoil is brown loam. The underlying material is grayish brown, calcareous very gravelly sand.

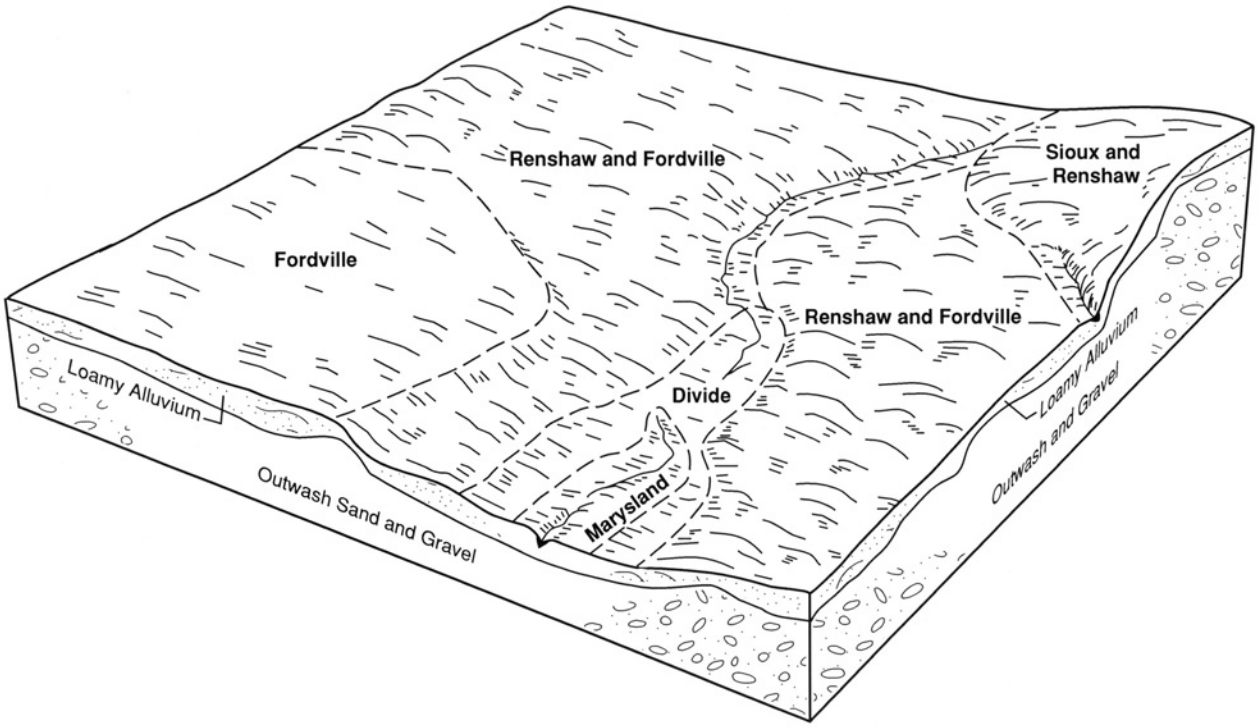

Figure 5.—Typical pattern of soils and underlying material in the Renshaw-Fordville association.

The well drained Fordville soils are on backslopes and footslopes. Slopes range from 0 to 6 percent. Typically, the surface layer is dark gray loam. The subsurface layer is dark grayish brown loam. The subsoil is dark grayish brown and yellowish brown loam. The underlying material is grayish brown very gravelly sand.

Of minor extent in this association are Barnes, Buse, Divide, Fairdale, La Prairie, LaDelle, Lamoure, Marysland, Moritz, Rauville, Sioux, and Spottswood soils. The well drained Barnes and well drained, calcareous Buse soils are not underlain by gravelly material. Barnes soils are on summits and backslopes, and Buse soils are on shoulder slopes. The somewhat poorly drained, calcareous Divide soils are on high flood plains. The moderately well drained Fairdale soils are on low flood plains. They are dissected by a meandering channel. The moderately well drained La Prairie and LaDelle soils are on high flood plains. The somewhat poorly drained and poorly drained Lamoure soils and the poorly drained Marysland soils are on low flood plains. The somewhat poorly drained Moritz soils are on high flood plains. The very poorly drained Rauville soils are on low flood plains. The excessively drained Sioux soils have gravelly material within a depth of 14 inches. They are on shoulder slopes. The somewhat poorly drained Spottswood soils are on footslopes.

About 60 percent of this association is cropland. Alfalfa, corn, soybeans, and small grain are the main crops. In cultivated areas, conserving moisture and controlling water erosion where slopes are more than 2 percent are the main management concerns. Most areas of this association are suited to cultivated crops and tame pasture and hay, but the soils are droughty. Many areas are irrigated. Generally, the steeper areas of the Renshaw soils are not suited to cultivated crops. Some areas that have not been cultivated support native vegetation and are used for range.

7. Lamoure-Divide-La Prairie Association

Poorly drained, somewhat poorly drained, and moderately well drained, level and nearly level, silty and loamy soils; on flood plains

This association is on broad, low flood plains and high flood plains adjacent to major creeks and the Big Sioux River. In many places the landscape is marked by old drainage channels and meander scars.

This association makes up about 4 percent of the

county. It is about 35 percent Lamoure soils, 15 percent Divide and similar soils, 15 percent La Prairie and similar soils, and 35 percent soils of minor extent.

The somewhat poorly drained and poorly drained Lamoure soils are on low flood plains. Slopes are 0 to 1 percent. Typically, the surface soil is very dark gray and dark gray, calcareous silty clay loam. The underlying material is olive gray, mottled, calcareous silty clay loam.

The somewhat poorly drained Divide soils are on high flood plains. Slopes range from 0 to 2 percent. Typically, the surface layer is very dark gray, calcareous loam. The subsoil is light brownish gray and light yellowish brown, calcareous loam and clay loam. It is mottled in the lower part. The underlying material is yellowish brown, mottled, calcareous gravelly sand.

The moderately well drained La Prairie soils are on high flood plains. Slopes range from 0 to 2 percent. Typically, the surface soil is dark gray, calcareous loam. The subsoil is dark gray and grayish brown, calcareous loam, clay loam, and silty clay loam. The underlying material is grayish brown and dark grayish brown, calcareous clay loam and silty clay loam. It is mottled in the lower part.

Of minor extent in this association are Castlewood, Egeland, Fairdale, Fordville, Lowe, Marysland, Moritz, Rauville, and Renshaw soils. The poorly drained Castlewood soils are on low flood plains. The well drained Egeland soils contain more sand than the major soils. They are on backslopes on outwash plains. The moderately well drained Fairdale soils are on low flood plains. They are dissected by a meandering channel. Fordville and Renshaw soils are underlain by gravelly material. The well drained Fordville soils are on backslopes and footslopes, and the excessively drained Renshaw soils are on backslopes. The poorly drained Lowe and somewhat poorly drained Moritz soils are calcareous at or near the surface and do not have gravelly material within a depth of 40 inches. They are in positions on the landscape similar to those of the major soils. The poorly drained Marysland soils are calcareous at or near the surface and are underlain by gravelly material at a depth of 20 to 40 inches. They are on low flood plains. The very poorly drained Rauville soils are on low flood plains.

About 70 percent of this association is cropland. Some areas support native grass and are used for grazing or wildlife habitat. Corn, soybeans, small grain, and alfalfa are the main crops. Controlling wind erosion and overcoming wetness are important management concerns in areas used for crops. The soils are suited to cultivated crops, tame pasture or hay, and rangeland.

Detailed Soil Map Units

The map units on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under the heading “Use and Management of the Soils.”

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Estelline silt loam, 0 to 2 percent slopes, is a phase of the Estelline series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes. A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Vienna-Brookings complex, 1 to 6 percent slopes, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

ArA—Arvilla sandy loam, 0 to 2 percent slopes

Composition

Arvilla and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 50 acres

Typical Profile

Surface soil:
0 to 12 inches—dark gray sandy loam

Subsoil:
12 to 22 inches—brown sandy loam
22 to 25 inches—pale brown, calcareous loamy sand

Underlying layer:
25 to 60 inches—light brownish gray, calcareous gravelly coarse sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 14 to 25 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Organic matter content: Moderate
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The well drained Egeland and Embden soils, which do not have gravel in the underlying material; on backslopes
• The well drained Fordville soils, which have more clay in the surface layer and subsoil than the Arvilla soil and have gravelly material at a depth of 20 to 40 inches; on backslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar inclusions:
• Soils that have more silt and clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Low available water capacity, wind erosion
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains the content of organic matter.

Interpretive Groups

Land capability classification: IIIs-3
Range site: Shallow to Gravel
Windbreak suitability group: 6
Pasture suitability group: D2

Ba—Badger silty clay loam

Composition

Badger and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Toeslopes
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 4 to 30 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 36 inches—gray silty clay
36 to 47 inches—grayish brown, mottled silty clay that has accumulations of gypsum

Underlying layer:
47 to 60 inches—light olive gray, mottled, calcareous silty clay loam that has accumulations of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till
Seasonal high water table: At the surface to 3 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow

Inclusions

Contrasting inclusions:
• Cubden soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins
• The moderately well drained Waubay soils, which have less clay and more silt in the subsoil than the Badger soil; on footslopes
• The very poorly drained Parnell soils in basins

Similar inclusions:
• Soils that have less clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and wheat
Management concerns: Wetness
Management measures:
• In wet years this soil is better suited to late-planted crops than to some other crops. Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to maintain tilth and improve the rate of water infiltration.

• Deferred tillage when the soil is wet helps to minimize surface compaction.

Interpretive Groups

Land capability classification: IIw-1
Range site: Loamy Overflow
Windbreak suitability group: 2
Pasture suitability group: A

BaB—Barnes clay loam, 2 to 6 percent slopes

Composition

Barnes and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 35 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray clay loam

Subsoil:
8 to 15 inches—dark brown clay loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes

Similar inclusions:
• Soils that have more silt in the surface layer and the upper part of the subsoil
• Soils that have more clay in the subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming helps to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIe-2
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BbB—Barnes-Buse loams, 2 to 6 percent slopes

Composition

Barnes and similar soils: 60 to 75 percent
Buse and similar soils: 15 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Barnes—summits and backslopes; Buse—shoulder slopes
Slope range: Barnes—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 65 acres

Typical Profile

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Barnes—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on shoulder slopes
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have less sand between the depths of 10 and 40 inches than the Barnes soil
• Soils that have more clay in the subsoil than the Barnes soil
• Soils that have more silt throughout

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Barnes—IIe-2; Buse—IIIe-6
Range site: Barnes—Silty; Buse—Thin Upland
Windbreak suitability group: Barnes—3; Buse—8
Pasture suitability group: Barnes—F; Buse—G

BbC—Barnes-Buse loams, 6 to 9 percent slopes

Composition

Barnes and similar soils: 50 to 60 percent
Buse and similar soils: 30 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Barnes—backslopes; Buse—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 4 to 50 acres

Typical Profile

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Barnes—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Tonka soils in basins
• The very poorly drained Parnell soils in basins
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes
• The somewhat poorly drained Badger soils on toeslopes

Similar inclusions:
• Soils that have more clay in the subsoil than the Barnes soil
• Soils that have more silt throughout than the Barnes soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control wind erosion and water erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Barnes—IIIe-1; Buse—IVe-2
Range site: Barnes—Silty; Buse—Thin Upland
Windbreak suitability group: Barnes—3; Buse—8
Pasture suitability group: Barnes—F; Buse—G

BcD—Barnes-Buse-Svea loams, 2 to 15 percent slopes

Composition

Barnes and similar soils: 35 to 45 percent
Buse and similar soils: 25 to 35 percent
Svea and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Barnes—summits and backslopes; Buse—shoulder slopes; Svea—footslopes
Slope range: Barnes—9 to 15 percent; Buse—9 to 15 percent; Svea—2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

Typical Profile

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Svea

Surface soil:
0 to 17 inches—dark gray loam

Subsoil:
17 to 25 inches—dark gray and brown clay loam
25 to 31 inches—brown, mottled clay loam
31 to 39 inches—light brownish gray, mottled, calcareous clay loam

Underlying layer:
39 to 60 inches—light brownish gray, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Barnes—well drained; Buse—well drained; Svea—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: Barnes—more than 6 feet; Buse—more than 6 feet; Svea—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Barnes—high; Buse—moderately low; Svea—high
Surface runoff: Barnes—rapid; Buse—rapid; Svea—medium
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Svea soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Arvilla soils, which have gravelly material at a depth of 14 to 25 inches; on shoulder slopes and the upper backslopes
• The very poorly drained Parnell soils in basins
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have more clay in the subsoil than the Barnes soil
• Soils that have more silt in the surface layer and subsoil than the Barnes soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, and spring wheat
Management concerns: Barnes—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Svea—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control wind erosion and water erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Barnes—IVe-1; Buse—VIe-3; Svea—IIe-1
Range site: Barnes—Silty; Buse—Thin Upland; Svea—Silty
Windbreak suitability group: Barnes—3; Buse—8; Svea—1
Pasture suitability group: Barnes—F; Buse—G; Svea—K

BnA—Barnes-Vienna complex, 0 to 2 percent slopes

Composition

Barnes and similar soils: 70 to 80 percent
Vienna and similar soils: 10 to 20 percent

Contrasting inclusions: 10 to 15 percent

Setting

Landform: Till plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Vienna

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 16 inches—dark grayish brown silty clay loam
16 to 21 inches—grayish brown clay loam
21 to 44 inches—light yellowish brown and pale yellow, calcareous clay loam

Underlying layer:
44 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Barnes—more than 60 inches; Vienna—10 to 20 inches over loamy glacial till
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The well drained Buse soils, which are calcareous to the surface; on shoulder slopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more clay in the subsoil than the Barnes soil
• Soils that are deeper to glacial till than the Vienna soil

Use and Management

Cropland

Main crops: Barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Barnes—I-2; Vienna—I-2
Range site: Barnes—Silty; Vienna—Silty
Windbreak suitability group: Barnes—3; Vienna—3
Pasture suitability group: Barnes—F; Vienna—F

BrA—Brandt silty clay loam, 0 to 2 percent slopes

Composition

Brandt and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 32 inches—dark grayish brown, brown, and yellowish brown silty clay loam and silt loam
32 to 42 inches—light yellowish brown, calcareous silt loam
42 to 49 inches—light yellowish brown, calcareous gravelly loam

Underlying layer:
49 to 60 inches—pale yellow, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to 60 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The well drained Estelline and Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
• Kranzburg and Poinsett soils, which are not underlain by gravelly material; on backslopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that are dark to a depth of more than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-2
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

BrB—Brandt silty clay loam, 2 to 6 percent slopes

Composition

Brandt and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 80 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 32 inches—dark grayish brown, brown, and yellowish brown silty clay loam and silt loam
32 to 42 inches—light yellowish brown, calcareous silt loam
42 to 49 inches—light yellowish brown, calcareous gravelly loam

Underlying layer:
49 to 60 inches—pale yellow, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to 60 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: High
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Estelline and Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes and footslopes
• Kranzburg and Poinsett soils, which are not underlain by gravelly material; on backslopes

• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that are dark to a depth of more than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control water erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIe-3
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

Bs—Brookings silty clay loam

Composition

Brookings and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 25 inches—dark gray silty clay loam
25 to 32 inches—light brownish gray, calcareous silty clay loam
32 to 48 inches—light gray, calcareous clay loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over loamy glacial till
Depth to seasonal high water table: 3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The well drained Kranzburg and Vienna soils, which are dark to a depth of less than 16 inches
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on the lower footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have glacial till below a depth of 40 inches
• Soils that are dark to a depth of more than 24 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-3
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

BtD—Buse-Barnes loams, 9 to 20 percent slopes

Composition

Buse and similar soils: 45 to 55 percent
Barnes and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Barnes—backslopes
Slope range: Buse—9 to 20 percent; Barnes—9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 60 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Barnes—high
Surface runoff: Rapid
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on summits and shoulder slopes
• The very poorly drained Parnell soils in basins
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes

Similar inclusions:
• Soils that have more clay in the subsoil than the Barnes soil
• Soils that have a thinner surface layer than the Buse soil

Use and Management

Crops and grazing

Main crops: Buse—unsuited to crops; Barnes—alfalfa, barley, corn, oats, and spring wheat
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Barnes—water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIe-3; Barnes—IVe-1
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—8; Barnes—3
Pasture suitability group: Buse—G; Barnes—F

BuC—Buse-Barnes loams, 2 to 15 percent slopes, very stony

Composition

Buse and similar soils: 40 to 60 percent
Barnes and similar soils: 30 to 60 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Barnes—backslopes

Slope range: Buse—3 to 15 percent; Barnes—2 to 9 percent
Shape of areas: Irregular
Size of areas: 4 to 20 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, iron-stained, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Barnes—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime. Scattered stones and boulders are on the surface of both soils.

Inclusions

Contrasting inclusions:
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes
• The somewhat excessively drained Renshaw and excessively drained Sioux soils, which have gravelly material at a depth of less than 20 inches; on shoulder slopes and backslopes
• The very poorly drained Parnell soils in basins
• The somewhat poorly drained Badger soils on toeslopes

Similar inclusions:
• Soils that have a thinner surface layer than the Buse soil
• Soils that have more clay in the subsoil than the Barnes soil

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Water erosion, numerous stones and boulders (rocks 1 to 3 feet in diameter cover 0.1 to 3.0 percent of the surface)
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIs-1; Barnes—VIIs-1
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—10; Barnes—10
Pasture suitability group: Buse—NS; Barnes—NS

BuE—Buse-Barnes loams, 9 to 40 percent slopes, very stony

Composition

Buse and similar soils: 50 to 70 percent
Barnes and similar soils: 20 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Barnes—backslopes
Slope range: Buse—9 to 40 percent; Barnes—9 to 25 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Barnes

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 15 inches—dark brown loam
15 to 22 inches—brown clay loam
22 to 36 inches—light yellowish brown, iron-stained, calcareous clay loam

Underlying layer:
36 to 60 inches—light yellowish brown, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Barnes—high
Surface runoff: Buse—very rapid; Barnes—rapid
Other properties: The Buse soil has a high content of lime. Scattered stones and boulders are on the surface.

Inclusions

Contrasting inclusions:
• The very poorly drained Parnell soils in basins
• The somewhat excessively drained Renshaw soils, which have gravelly material within a depth of 20 inches; on shoulder slopes and backslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes and backslopes
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes

Similar inclusions:
• Soils that have a thinner surface layer than the Buse soil
• Soils that have more clay in the subsoil than the Barnes soil

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Water erosion, numerous stones and boulders (rocks 1 to 3 feet in diameter cover 0.1 to 3.0 percent of the surface)
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIs-1; Barnes—VIIs-1
Range site: Buse—Thin Upland; Barnes—Silty
Windbreak suitability group: Buse—10; Barnes—10
Pasture suitability group: Buse—NS; Barnes—NS

BvD—Buse-Lamoure, channeled, complex, 0 to 40 percent slopes

Composition

Buse and similar soils: 40 to 60 percent
Lamoure and similar soils: 20 to 40 percent
Contrasting inclusions: 10 to 25 percent

Setting

Landform: Till plains and flood plains
Landform position: Buse—backslopes and shoulder slopes; Lamoure—low flood plains
Slope range: Buse—9 to 40 percent; Lamoure—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 60 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Lamoure

Surface soil:
0 to 35 inches—very dark gray and dark gray, calcareous silty clay loam

Underlying layer:
35 to 60 inches—olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Buse—well drained; Lamoure—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Buse—more than 60 inches; Lamoure—40 to more than 60 inches over sandy or gravelly material
Seasonal high water table: Buse—at a depth of more than 6 feet; Lamoure—at the surface to 1.5 feet below the surface
Flooding: Buse—none; Lamoure—frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Lamoure—high
Surface runoff: Buse—rapid; Lamoure—very slow
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Barnes soils, which are calcareous at a greater depth than the Buse soil; on backslopes
• The moderately well drained La Prairie soils on low flood plains
• The very poorly drained Rauville soils on low flood plains
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar inclusions:
• Soils that have more salts in the surface layer and subsoil than the Lamoure soil
• Soils that have a thinner surface layer than the Buse soil

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Buse—wind erosion, water erosion, steep slopes; Lamoure—wetness, wind erosion, meandering channels
Management measures:
• Proper grazing management helps to maintain plant vigor and control erosion.

Interpretive Groups

Land capability classification: Buse—VIIe-1; Lamoure—VIw-1
Range site: Buse—Thin Upland; Lamoure—Subirrigated
Windbreak suitability group: Buse—10; Lamoure—2
Pasture suitability group: Buse—NS; Lamoure—NS

BxE—Buse-Langhei complex, 15 to 40 percent slopes

Composition

Buse and similar soils: 30 to 60 percent
Langhei and similar soils: 25 to 45 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes and backslopes; Langhei—shoulder slopes
Slope range: Buse—15 to 40 percent; Langhei—25 to 40 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Langhei

Surface layer:
0 to 4 inches—dark gray, calcareous clay loam

Underlying layer:
4 to 15 inches—light brownish gray, calcareous clay loam
15 to 60 inches—pale yellow, calcareous clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Buse—moderately low; Langhei—low
Surface runoff: Buse—rapid; Langhei—very rapid

Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Barnes, Kranzburg, and Vienna soils, which are calcareous at a greater depth than the Buse and Langhei soils; on backslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches; on footslopes
• The poorly drained Lamoure soils on low flood plains

Similar inclusions:
• Soils that have more silt in the subsoil than the Buse soil

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Wind erosion and water erosion
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.

Interpretive Groups

Land capability classification: Buse—VIIe-1; Langhei—VIIe-1
Range site: Buse—Thin Upland; Langhei—Thin Upland
Windbreak suitability group: Buse—10; Langhei—10
Pasture suitability group: Buse—NS; Langhei—NS

ByC—Buse-Poinsett complex, 6 to 9 percent slopes

Composition

Buse and similar soils: 40 to 55 percent
Poinsett and similar soils: 30 to 40 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Poinsett—backslopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Buse—more than 60 inches; Poinsett—40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Buse—moderately slow; Poinsett—moderate
Available water capacity: High
Organic matter content: Buse—moderately low; Poinsett—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have less sand and more silt throughout than the Buse soil
• Soils that have 20 to 40 inches of silty material over glacial till

Use and Management

Cropland

Main crops: Barley, corn, oats, soybeans, and spring wheat
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Poinsett—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Buse—IVe-2; Poinsett—IIIe-2
Range site: Buse—Thin Upland; Poinsett—Silty
Windbreak suitability group: Buse—8; Poinsett—3
Pasture suitability group: Buse—G; Poinsett—F

ByD—Buse-Poinsett complex, 9 to 15 percent slopes

Composition

Buse and similar soils: 45 to 60 percent
Poinsett and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Moraines
Landform position: Buse—shoulder slopes; Poinsett—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Buse—more than 60 inches; Poinsett—40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Buse—moderately slow; Poinsett—moderate
Available water capacity: High
Organic matter content: Buse—moderately low; Poinsett—high
Surface runoff: Rapid
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toeslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have less sand and more silt throughout than the Buse soil

• Soils that have a thinner surface layer than the Buse soil
• Soils that have less than 40 inches of silty material over glacial till

Use and Management

Cropland and pasture

Main crops: Barley, oats, and spring wheat
Management concerns: Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Poinsett—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Permanent pasture or hayland species should be established.
• Proper grazing management helps to maintain plant vigor and control erosion.

Interpretive Groups

Land capability classification: Buse—VIe-3; Poinsett—IVe-1
Range site: Buse—Thin Upland; Poinsett—Silty
Windbreak suitability group: Buse—8; Poinsett—3
Pasture suitability group: Buse—G; Poinsett—F

Ca—Castlewood silty clay

Composition

Castlewood and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 10 acres

Typical Profile

Surface soil:
0 to 18 inches—very dark gray silty clay

Subsoil:
18 to 46 inches—dark gray and olive gray clay

Underlying layer:
46 to 50 inches—gray sandy loam
50 to 60 inches—light gray and light olive gray, stratified clay loam, loam, sandy loam, and gravelly loamy coarse sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over gravelly material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for long periods
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow

Inclusions

Contrasting inclusions:
• The moderately well drained La Prairie and LaDelle soils on high flood plains
• Lamoure soils, which have more silt and less clay in the subsoil than the Castlewood soil; on low flood plains
• The somewhat poorly drained Spottswood soils, which have gravelly material at a depth of 20 to 40 inches; on toeslopes

Similar inclusions:
• Soils that are calcareous to the surface

Use and Management

Cropland

Main crops: Corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years this soil is better suited to late-planted crops than to some other crops. Deferred tillage when the soil is wet helps to maintain tilth and minimizes surface compaction.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-2
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

Co—Colvin-Oldham silty clay loams

Composition

Colvin and similar soils: 40 to 55 percent
Oldham and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Landform position: Colvin—toeslopes; Oldham—basins
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 40 acres

Typical Profile

Colvin

Surface layer:
0 to 7 inches—dark gray, calcareous silty clay loam

Subsoil:
7 to 17 inches—light brownish gray, mottled, calcareous silty clay loam
17 to 35 inches—light brownish gray, mottled, calcareous silty clay loam that has accumulations of gypsum

Underlying layer:
35 to 49 inches—light gray, mottled, calcareous silty clay loam that has accumulations of gypsum
49 to 60 inches—light gray, mottled, calcareous silty clay loam

Oldham

Surface layer:
0 to 9 inches—dark gray, calcareous silty clay loam

Subsoil:
9 to 24 inches—gray, calcareous silty clay loam
24 to 44 inches—gray and light olive gray, mottled, calcareous silty clay that has accumulations of gypsum in the upper part

Underlying layer:
44 to 60 inches—gray and light olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Colvin—poorly drained; Oldham—very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Colvin—40 to more than 60 inches over finer or coarser material; Oldham—40 to more than 60 inches over glacial till
Seasonal high water table: Colvin—1.0 foot above to 1.0 foot below the surface; Oldham—at a depth of 0.5 foot to 1.5 feet
Flooding: None
Ponding: Occasional for brief periods
Permeability: Colvin—moderately slow; Oldham—slow
Available water capacity: High
Organic matter content: High
Surface runoff: Colvin—very slow; Oldham—negligible
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• Playmoor soils, which have more salt in the subsoil than the Colvin soil
• Southam soils, which are ponded during much of the growing season

Similar inclusions:
• Soils that have more sand and less silt throughout than the Colvin soil
• Soils that are calcareous at a greater depth than the Oldham soil

Use and Management

Cropland and pasture

Suitability: Oldham—unsuited to crops in undrained areas
Main crops: Barley, oats, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In most years these soils are better suited to late-planted crops than to some other crops. Deferred tillage when the soils are wet helps to maintain tilth and minimize surface compaction.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Maintaining existing drainage systems helps to remove excess water.

• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: Colvin—IVw-3; Oldham—Vw-2
Range site: Colvin—Wetland; Oldham—Wetland
Windbreak suitability group: Colvin—10; Oldham—10
Pasture suitability group: Colvin—B1; Oldham—B2

Cu—Cubden-Badger silty clay loams

Composition

Cubden and similar soils: 50 to 65 percent
Badger and similar soils: 25 to 35 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Landform position: Cubden—footslopes; Badger—toeslopes
Slope range: Cubden—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 4 to 40 acres

Typical Profile

Cubden

Surface layer:
0 to 9 inches—dark gray, calcareous silty clay loam

Transitional layer:
9 to 14 inches—dark gray, calcareous silty clay loam

Subsoil:
14 to 40 inches—grayish brown and light yellowish brown, calcareous silty clay loam

Underlying layer:
40 to 45 inches—light yellowish brown, mottled, calcareous silty clay loam
45 to 60 inches—light gray, mottled, calcareous silt loam and silty clay loam

Badger

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 36 inches—gray silty clay
36 to 47 inches—grayish brown, mottled silty clay that has accumulations of gypsum

Underlying layer:
47 to 60 inches—light olive gray, mottled, calcareous silty clay loam that has accumulations of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Cubden—40 to more than 60 inches over loamy glacial till; Badger—40 to more than 60 inches over glacial till
Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Badger—at the surface to 3.0 feet below the surface
Flooding: Cubden—none; Badger—frequent for brief periods
Ponding: None
Permeability: Cubden—moderate; Badger—slow
Available water capacity: High
Organic matter content: Cubden—moderate; Badger—high
Surface runoff: Cubden—slow; Badger—very slow
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils on toeslopes
• The well drained Poinsett soils on backslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have more sand and less silt throughout than the Cubden soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Cubden—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Badger—wetness
Management measures:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Practices that reduce runoff from adjacent soils

help to control wetness. Deferred tillage on the Badger soil during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Cubden—IIs-4; Badger—IIw-1
Range site: Cubden—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: Cubden—1; Badger—2
Pasture suitability group: Cubden—F; Badger—A

Cx—Cubden-Tonka silty clay loams

Composition

Cubden and similar soils: 50 to 75 percent
Tonka and similar soils: 20 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Cubden—footslopes; Tonka—basins
Slope range: Cubden—0 to 2 percent; Tonka—0 to 1 percent
Shape of areas: Irregular
Size of areas: 4 to 50 acres

Typical Profile

Cubden

Surface layer:
0 to 9 inches—dark gray, calcareous silty clay loam

Transitional layer:
9 to 14 inches—dark gray, calcareous silty clay loam

Subsoil:
14 to 40 inches—grayish brown and light yellowish brown, calcareous silty clay loam

Underlying layer:
40 to 45 inches—light yellowish brown, mottled, calcareous silty clay loam
45 to 60 inches—light gray, mottled, calcareous silt loam and silty clay loam

Tonka

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsurface layer:
10 to 18 inches—gray, mottled silt loam

Subsoil:
18 to 40 inches—dark gray silty clay
40 to 45 inches—grayish brown and light brownish gray silty clay

Underlying layer:
45 to 60 inches—light gray, mottled silty clay loam

Soil Properties and Qualities

Drainage class: Cubden—somewhat poorly drained; Tonka—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Cubden—40 to more than 60 inches over loamy glacial till; Tonka—more than 60 inches
Seasonal high water table: Cubden—at a depth of 1.5 to 3.5 feet; Tonka—0.5 foot above to 1.0 foot below the surface
Flooding: None
Ponding: Cubden—none; Tonka—frequent for long periods
Permeability: Cubden—moderate; Tonka—slow
Available water capacity: High
Organic matter content: Cubden—moderate; Tonka—high
Surface runoff: Cubden—slow; Tonka—negligible
Other properties: The Cubden soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Poinsett soils on backslopes
• The moderately well drained Waubay soils on footslopes

Similar inclusions:
• Soils that have more sand and less silt throughout than the Cubden soil

Use and Management

Cropland and grazing

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Cubden—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Tonka—wetness
Management measures:
• In wet years these soils are better suited to late-planted crops than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Restricting grazing during wet periods helps to prevent surface compaction.
• Maintaining existing drainage systems helps to

remove excess water on the Tonka soil. Deferred tillage when the soil is wet helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Cubden—IIs-4; Tonka—IVw-2
Range site: Cubden—Limy Subirrigated; Tonka—Wet Meadow
Windbreak suitability group: Cubden—1; Tonka—10
Pasture suitability group: Cubden—F; Tonka—B2

Dv—Divide loam

Composition

Divide and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 20 acres

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, calcareous loam

Subsoil:
9 to 17 inches—light brownish gray, calcareous loam
17 to 30 inches—light yellowish brown, mottled, calcareous loam

Underlying layer:
30 to 60 inches—yellowish brown, calcareous gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Depth to seasonal high water table: 1.5 to 3.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: Moderate
Surface runoff: Slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Fordville and somewhat excessively drained Renshaw soils, which are calcareous at a greater depth than the Divide soil; on backslopes and footslopes along the edges of the mapped areas
• The poorly drained Marysland soils, which have a higher water table than the Divide soil; on low flood plains
• The somewhat poorly drained Moritz soils, which are deeper to gravelly material than the Divide soil

Similar inclusions:
• Soils that have loamy glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: The moderate available water capacity, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: IIIs-4
Range site: Limy Subirrigated
Windbreak suitability group: 1
Pasture suitability group: D1

EgB—Egeland-Embden complex, 2 to 6 percent slopes

Composition

Egeland and similar soils: 50 to 75 percent
Embden and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Egeland—summits and backslopes; Embden—footslopes

Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Egeland

Surface layer:
0 to 7 inches—dark gray sandy loam

Subsurface layer:
7 to 10 inches—dark gray sandy loam

Subsoil:
10 to 25 inches—light olive brown sandy loam
25 to 37 inches—light yellowish brown, calcareous loamy sand
37 to 52 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
52 to 60 inches—light yellowish brown, calcareous fine sandy loam

Embden

Surface soil:
0 to 13 inches—very dark gray fine sandy loam

Subsoil:
13 to 45 inches—dark grayish brown and brown sandy loam

Underlying layer:
45 to 60 inches—light olive brown fine sandy loam

Soil Properties and Qualities

Drainage class: Egeland—well drained; Embden—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egeland—40 to more than 60 inches over glacial till; Embden—40 to more than 60 inches over finer or coarser material
Depth to seasonal high water table: Egeland—more than 6 feet; Embden—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderately rapid
Available water capacity: Moderate
Organic matter content: Egeland—moderate; Embden—high
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Arvilla and Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
• Poinsett soils, which have more silt and clay than the Egeland soil; on backslopes
• Strayhoss soils, which have more silt and clay in the surface layer and subsoil than the Egeland soil
• Maddock soils, which have more sand than the major soils; on shoulder slopes

Similar inclusions:
• Soils that have silty and loamy material below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Wind erosion, water erosion, moderate available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Egeland—IIIe-7; Embden—IIIe-7
Range site: Egeland—Sandy; Embden—Sandy
Windbreak suitability group: Egeland—5; Embden—1
Pasture suitability group: Egeland—H; Embden—H

EmC—Egeland-Maddock sandy loams, 6 to 9 percent slopes

Composition

Egeland and similar soils: 45 to 60 percent
Maddock and similar soils: 25 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Egeland—summits and backslopes; Maddock—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Egeland

Surface layer:
0 to 7 inches—dark gray sandy loam

Subsurface layer:
7 to 10 inches—dark gray sandy loam

Subsoil:
10 to 25 inches—light olive brown sandy loam
25 to 37 inches—light yellowish brown, calcareous loamy sand
37 to 52 inches—light yellowish brown, calcareous sandy loam

Underlying layer:
52 to 60 inches—light yellowish brown, calcareous fine sandy loam

Maddock

Surface layer:
0 to 5 inches—dark gray sandy loam

Subsurface layer:
5 to 9 inches—dark grayish brown sandy loam

Subsoil:
9 to 24 inches—dark brown and brown loamy sand

Underlying layer:
24 to 60 inches—pale brown, calcareous loamy sand

Soil Properties and Qualities

Drainage class: Egeland—well drained; Maddock—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Egeland—40 to more than 60 inches over glacial till; Maddock—40 to more than 60 inches over loamy material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Egeland—moderately rapid; Maddock—rapid
Available water capacity: Egeland—moderate; Maddock—low
Organic matter content: Egeland—moderate; Maddock—moderately low
Surface runoff: Egeland—medium; Maddock—slow

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Arvilla and Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
• The well drained Embden soils, which are dark to a depth of more than 16 inches; on footslopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• Poinsett and Vienna soils, which have more clay than the major soils; on backslopes

Similar inclusions:
• Soils that have more clay and less sand in the surface layer than the Egeland soil

Use and Management

Cropland

Main crops: Alfalfa, barley, oats, and spring wheat
Management concerns: Wind erosion, water erosion, moderate available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: Egeland—IVe-3; Maddock—IVe-3
Range site: Egeland—Sandy; Maddock—Sandy
Windbreak suitability group: Egeland—5; Maddock—5
Pasture suitability group: Egeland—H; Maddock—H

EsA—Estelline silt loam, 0 to 2 percent slopes

Composition

Estelline and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 135 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray silt loam

Subsoil:
9 to 22 inches—dark grayish brown silt loam
22 to 33 inches—light olive brown silty clay loam
33 to 36 inches—light yellowish brown, calcareous loam

Underlying layer:
36 to 49 inches—light yellowish brown and yellowish brown, calcareous gravelly sandy loam and gravelly loamy sand

49 to 60 inches—pale brown, calcareous sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 22 to 40 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The well drained Kranzburg soils, which have glacial till within a depth of 40 inches; on backslopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes

Similar inclusions:
• Soils that have more sand in the subsoil
• Soils that have more sand and less gravel in the underlying layer
• Soils that are dark to a depth of less than 16 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Moderate available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIs-3
Range site: Silty
Windbreak suitability group: 6
Pasture suitability group: D1

EsB—Estelline silt loam, 2 to 6 percent slopes

Composition

Estelline and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 4 to 70 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray silt loam

Subsoil:
9 to 22 inches—dark grayish brown silt loam
22 to 33 inches—light olive brown silty clay loam
33 to 36 inches—light yellowish brown, calcareous loam

Underlying layer:
36 to 49 inches—light yellowish brown and yellowish brown, calcareous gravelly sandy loam and gravelly loamy sand
49 to 60 inches—pale brown, calcareous sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 22 to 40 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Kranzburg soils, which have glacial till within a depth of 40 inches; on backslopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes

• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar inclusions:
• Soils that have more sand in the subsoil
• Soils that have more sand and less gravel in the underlying layer
• Soils that are dark to a depth of less than 11 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion, moderate available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIe-5
Range site: Silty
Windbreak suitability group: 6
Pasture suitability group: D1

Fa—Fairdale loam, channeled

Composition

Fairdale and similar soils: 70 to 80 percent
Contrasting inclusions: 20 to 30 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 20 to 1,000 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray, calcareous loam

Underlying layer:
8 to 52 inches—gray, calcareous, stratified loam that has thin layers of fine sandy loam, sandy loam, and loamy coarse sand
52 to 60 inches—gray, mottled, calcareous, stratified loamy coarse sand, loam, and sandy loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over sandy material
Depth to seasonal high water table: 3 to 5 feet
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: This soil typically is dissected by a meandering channel.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The moderately well drained La Prairie soils, which are dark to a depth of more than 24 inches
• Water in the meandering stream channel
• The very poorly drained Rauville soils, which have more silt and less sand throughout than the Fairdale soil; on low flood plains

Similar inclusions:
• Soils that have more silt and less sand throughout
• Soils that are not stratified between depths of 10 and 24 inches
• Soils that have more sand and less clay

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Wetness and the meandering channels, which severely limit the use of machinery
Management measures:
• Proper grazing management helps to maintain vigor and control streambank erosion.

Interpretive Groups

Land capability classification: VIw-1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: NS

FdA—Fordville loam, 0 to 2 percent slopes

Composition

Fordville and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 60 acres

Typical Profile

Surface layer:
0 to 4 inches—dark gray loam

Subsurface layer:
4 to 11 inches—dark grayish brown loam

Subsoil:
11 to 17 inches—dark grayish brown loam
17 to 30 inches—yellowish brown loam

Underlying layer:
30 to 60 inches—grayish brown very gravelly sand

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Arvilla soils, which have more sand in the subsoil than the Fordville soil; on backslopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; on backslopes
• The somewhat poorly drained Divide soils, which are calcareous at or near the surface; on footslopes
• The well drained Barnes soils, which are not underlain by gravelly material; on backslopes

Similar inclusions:
• Soils that have loamy glacial till below a depth of 40 inches
• Soils that have more silt and less sand in the surface layer and subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Moderate available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
• Including grasses and legumes in the rotation helps to maintain tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIs-3
Range site: Silty
Windbreak suitability group: 6
Pasture suitability group: D1

FoB—Fordville-Renshaw loams, 2 to 6 percent slopes

Composition

Fordville and similar soils: 60 to 70 percent
Renshaw and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Fordville—backslopes and footslopes; Renshaw—summits and shoulder slopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 90 acres

Typical Profile

Fordville

Surface layer:
0 to 4 inches—dark gray loam

Subsurface layer:
4 to 11 inches—dark grayish brown loam

Subsoil:
11 to 17 inches—dark grayish brown loam

17 to 30 inches—yellowish brown loam

Underlying layer:
30 to 60 inches—grayish brown very gravelly sand

Renshaw

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Fordville—well drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Fordville—20 to 40 inches over gravelly material; Renshaw—14 to 20 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Fordville—moderate; Renshaw—low
Organic matter content: Fordville—high; Renshaw—moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat excessively drained Arvilla soils, which have more sand in the surface layer and subsoil than the major soils; on shoulder slopes and the upper backslopes
• The somewhat poorly drained Divide soils, which are calcareous at or near the surface and have gravelly material at a depth of 20 to 40 inches; on footslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
• The well drained Barnes soils, which are not underlain by gravelly material; on backslopes

Similar inclusions:
• Soils that have more silt and less sand in the surface layer and subsoil than the Fordville soil
• Soils that have loamy glacial till below a depth of 40 inches

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion, limited available water capacity
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Windbreaks can reduce the effects of erosion (fig. 6).
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Fordville—IIe-5; Renshaw—IVs-2
Range site: Fordville—Silty; Renshaw—Shallow to Gravel
Windbreak suitability group: Fordville—6; Renshaw—6
Pasture suitability group: Fordville—D1; Renshaw—D2

HeA—Hetland silty clay loam, 0 to 2 percent slopes

Composition

Hetland and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Ice-walled lake plains
Landform position: Summits
Slope range: 0 to 2 percent
Shape of areas: Oval
Size of areas: 10 to 50 acres

Typical Profile

Surface soil:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 21 inches—dark grayish brown silty clay
21 to 29 inches—light yellowish brown, calcareous silty clay loam

Figure 6.—A farmstead windbreak in an area of Fordville-Renshaw loams, 2 to 6 percent slopes, helps to protect the home and livestock from the effects of the wind. Photo courtesy of Beth Lantgen.

29 to 39 inches—light yellowish brown, mottled, calcareous silty clay loam

Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes
- The well drained Poinsett soils, which have more silt and less clay in the subsoil than the Hetland soil; on backslopes
- The very poorly drained Tonka soils in basins
- The moderately well drained Waubay soils, which have less clay in the subsoil than the Hetland soil; on footslopes

Similar inclusions:
- Soils that have more clay and less silt

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-2
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

HeB—Hetland silty clay loam, 2 to 6 percent slopes

Composition

Hetland and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Ice-walled lake plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 10 to 60 acres

Typical Profile

Surface soil:
0 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 21 inches—dark grayish brown silty clay
21 to 29 inches—light yellowish brown, calcareous silty clay loam
29 to 39 inches—light yellowish brown, mottled, calcareous silty clay loam

Underlying layer:
39 to 60 inches—light yellowish brown, mottled, calcareous, varved silty clay loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes
• The well drained Poinsett soils, which have more silt and less clay in the subsoil than the Hetland soil; on backslopes
• The very poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more clay and less silt

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control water erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIe-3
Range site: Silty
Windbreak suitability group: 4
Pasture suitability group: F

KrA—Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes

Composition

Kranzburg and similar soils: 55 to 75 percent
Brookings and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Landform position: Kranzburg—summits and backslopes; Brookings—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 120 acres

Typical Profile

Kranzburg

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 26 inches—dark brown and brown silty clay loam
26 to 44 inches—light yellowish brown, calcareous clay loam

Underlying layer:
44 to 60 inches—light brownish gray, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 25 inches—dark gray silty clay loam
25 to 32 inches—light brownish gray, calcareous silty clay loam
32 to 48 inches—light gray, calcareous clay loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over loamy glacial till
Depth to seasonal high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes

Similar inclusions:
• Soils that have glacial till within a depth of 20 inches
• Soils that are more than 40 inches deep over glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Kranzburg—I-2; Brookings—I-3
Range site: Kranzburg—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Kranzburg—3; Brookings—1
Pasture suitability group: Kranzburg—F; Brookings—K

KrB—Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes

Composition

Kranzburg and similar soils: 60 to 80 percent
Brookings and similar soils: 15 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Till plains
Landform position: Kranzburg—summits and backslopes; Brookings—footslopes
Slope range: Kranzburg—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 110 acres

Typical Profile

Kranzburg

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 26 inches—dark brown and brown silty clay loam
26 to 44 inches—light yellowish brown, calcareous clay loam

Underlying layer:
44 to 60 inches—light brownish gray, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 25 inches—dark gray silty clay loam
25 to 32 inches—light brownish gray, calcareous silty clay loam
32 to 48 inches—light gray, calcareous clay loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Kranzburg—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over loamy glacial till
Depth to seasonal high water table: Kranzburg—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Kranzburg—medium; Brookings—slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The poorly drained Lamoure soils, which are calcareous at or near the surface; on low flood plains
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes

Similar inclusions:
• Soils that have glacial till within a depth of 20 inches
• Soils that are more than 40 inches deep over glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Kranzburg—water erosion; Brookings—slight
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Kranzburg—IIe-3; Brookings—I-3
Range site: Kranzburg—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Kranzburg—3; Brookings—1
Pasture suitability group: Kranzburg—F; Brookings—K

La—La Prairie loam

Composition

La Prairie and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 30 acres

Typical Profile

Surface soil:
0 to 17 inches—dark gray, calcareous loam

Subsoil:
17 to 27 inches—dark gray, calcareous loam
27 to 35 inches—dark gray, calcareous clay loam
35 to 45 inches—grayish brown, calcareous silty clay loam

Underlying layer:
45 to 55 inches—grayish brown, calcareous clay loam and silty clay loam; mottled in the lower part

55 to 60 inches—dark grayish brown, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over clayey or sandy material
Depth to seasonal high water table: 3.5 to 5.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils, which have more clay and less sand in the subsoil than the La Prairie soil; on low flood plains
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The poorly drained Lamoure soils, which have more silt and less sand throughout than the La Prairie soil; on low flood plains

Similar inclusions:
• Soils that have more silt and less sand throughout
• Soils that are more stratified

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Ld—LaDelle silt loam

Composition

LaDelle and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: High flood plains
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 5 to 40 acres

Typical Profile

Surface soil:
0 to 20 inches—dark gray silt loam; calcareous in the lower part

Subsoil:
20 to 32 inches—gray, calcareous silt loam

Underlying layer:
32 to 60 inches—gray, calcareous silt loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: 3.5 to 5.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils, which have more clay and less sand in the subsoil than the LaDelle soil; on low flood plains
• The well drained Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The poorly drained Lamoure soils on low flood plains
• The poorly drained Playmoor soils, which have salts at or near the surface; on low flood plains

Similar inclusions:
• Soils that have more sand and less clay throughout

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-1
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Lm—Lamoure silty clay loam

Composition

Lamoure and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 4 to 35 acres

Typical Profile

Surface soil:
0 to 35 inches—very dark gray and dark gray, calcareous silty clay loam

Underlying layer:
35 to 60 inches—olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over sandy or gravelly material
Seasonal high water table: At the surface to 2 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils, which have more clay and less sand in the subsoil than the Lamoure soil; on low flood plains
• The somewhat poorly drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The moderately well drained La Prairie and LaDelle soils on high flood plains
• The very poorly drained Rauville soils on low flood plains

Similar inclusions:
• Soils that have more salts in the surface layer and subsoil
• Soils that have gravelly material below a depth of 40 inches
• Soils that have more carbonates in the subsoil

Use and Management

Cropland

Main crops: Corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet help to maintain tilth, minimize surface compaction, and help to control wind erosion.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IIIw-2
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Lr—Lamoure-Rauville silty clay loams, channeled

Composition

Lamoure and similar soils: 50 to 70 percent
Rauville and similar soils: 20 to 30 percent
Contrasting inclusions: 5 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 10 to 50 acres

Typical Profile

Lamoure

Surface soil:
0 to 35 inches—very dark gray and dark gray, calcareous silty clay loam

Underlying layer:
35 to 60 inches—olive gray, mottled, calcareous silty clay loam

Rauville

Surface layer:
0 to 9 inches—gray, calcareous silty clay loam

Subsurface layer:
9 to 37 inches—gray and very dark gray, calcareous silt loam and silty clay loam

Underlying layer:
37 to 60 inches—gray, mottled, calcareous silty clay

Soil Properties and Qualities

Drainage class: Lamoure—poorly drained; Rauville—very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Lamoure—40 to more than 60 inches over sandy or gravelly material; Rauville—40 to more than 60 inches over gravelly material
Seasonal high water table: Lamoure—at the surface to 1.5 feet below the surface; Rauville—at the surface to 0.5 foot below the surface
Flooding: Lamoure—frequent for brief periods; Rauville—frequent for long periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The well drained Buse soils on shoulder slopes along the edges of the mapped areas
• The somewhat poorly drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The poorly drained Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on low flood plains

Similar inclusions:
• Soils that have more salts than the Lamoure soil
• Soils that have more carbonates in the subsoil than the Lamoure soil

Use and Management

Crops and grazing

Suitability: Generally not used for crops
Management concerns: Wetness and the meandering channels, which limit cultivation
Management measures:
• Proper grazing management helps to maintain plant vigor.

Interpretive Groups

Land capability classification: Lamoure—VIw-1; Rauville—Vw-1
Range site: Lamoure—Subirrigated; Rauville—Wetland
Windbreak suitability group: Lamoure—2; Rauville—10
Pasture suitability group: Lamoure—NS; Rauville—NS

Lw—Lowe loam

Composition

Lowe and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Surface layer:
0 to 7 inches—very dark gray, calcareous loam

Subsurface layer:
7 to 12 inches—dark gray, calcareous clay loam

Subsoil:
12 to 20 inches—dark gray, calcareous clay loam
20 to 29 inches—grayish brown, mottled, calcareous loam

Underlying layer:
29 to 42 inches—dark gray and grayish brown, mottled, calcareous clay loam and sandy loam
42 to 60 inches—light gray, mottled, calcareous loam

Soil Properties and Qualities

Drainage class: Poorly drained

Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over gravelly material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils, which have more clay and less sand in the subsoil than the Lowe soil; on low flood plains
• The somewhat poorly drained Divide and poorly drained Marysland soils, which have gravelly material at a depth of 20 to 40 inches
• The very poorly drained Rauville soils on low flood plains
• The somewhat poorly drained Moritz soils on high flood plains

Similar inclusions:
• Soils that have fewer carbonates in the subsoil
• Soils that contain more silt

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth, minimize surface compaction, and help to control wind erosion.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: IVw-3
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Ma—Marysland loam

Composition

Marysland and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 4 to 30 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Subsurface layer:
9 to 14 inches—dark gray, calcareous loam

Subsoil:
14 to 23 inches—gray, calcareous loam
23 to 38 inches—light olive gray, mottled, calcareous loam

Underlying layer:
38 to 60 inches—light brownish gray, mottled, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Depth to seasonal high water table: 0.5 foot to 1.5 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils in the slightly higher positions on the landscape
• Lamoure and Lowe soils, which are not underlain by gravelly material within a depth of 40 inches; on low flood plains
• The very poorly drained Rauville soils on low flood plains

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, and soybeans
Management concerns: Wetness, wind erosion, the moderate available water capacity, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In most years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth and help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-3
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: B1

MbA—Mauvais clay loam, 0 to 2 percent slopes

Composition

Mauvais and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Wave-cut platforms
Landform position: Toeslopes
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 4 to 15 acres

Typical Profile

Surface layer:
0 to 5 inches—dark gray, calcareous clay loam

Underlying layer:
5 to 22 inches—light brownish gray and gray, calcareous loam
22 to 60 inches—light gray and light olive gray, mottled, calcareous clay loam that has accumulations of salt

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Depth to seasonal high water table: 1.0 to 3.5 feet
Flooding: None
Ponding: Rare for long or very long periods
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Moderate
Surface runoff: Slow
Other properties: This soil has a high content of lime. Ponding occurs in a cyclic pattern. The soil may be ponded continuously for several years and then not ponded for many years.

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils, which have more silt and less sand throughout than the Mauvais soil; on toeslopes
• The poorly drained Minnewaukan soils, which have more sand throughout than the Mauvais soil; on toeslopes
• The poorly drained Oldham and very poorly drained Southam soils in basins

Similar inclusions:
• Soils that have more sand and less clay in the surface layer

Use and Management

Cropland

Main crops: Barley, oats, and spring wheat
Management concerns: Wetness, wind erosion
Management measures:
• In wet years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth and help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: IVw-3
Range site: Subirrigated
Windbreak suitability group: 10
Pasture suitability group: A

Mc—McIntosh-Badger silty clay loams

Composition

McIntosh and similar soils: 45 to 60 percent
Badger and similar soils: 25 to 40 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: McIntosh—footslopes; Badger—toeslopes
Slope range: McIntosh—0 to 2 percent; Badger—0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 4 to 20 acres

Typical Profile

McIntosh

Surface layer:
0 to 9 inches—dark gray, calcareous silty clay loam

Subsoil:
9 to 16 inches—grayish brown, calcareous silty clay loam
16 to 29 inches—light brownish gray, calcareous silt loam

Underlying layer:
29 to 37 inches—light yellowish brown, calcareous clay loam
37 to 60 inches—light yellowish brown, mottled, calcareous clay loam

Badger

Surface layer:
0 to 8 inches—very dark gray silty clay loam

Subsoil:
8 to 36 inches—gray silty clay
36 to 47 inches—grayish brown, mottled silty clay that has accumulations of gypsum

Underlying layer:
47 to 60 inches—light olive gray, mottled, calcareous silty clay loam that has accumulations of gypsum

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: McIntosh—24 to 40 inches over loamy glacial till; Badger—40 to more than 60 inches over glacial till
Seasonal high water table: McIntosh—at a depth of 1.5 to 2.5 feet; Badger—at the surface to 3.0 feet below the surface
Flooding: McIntosh—none; Badger—frequent for brief periods
Ponding: None
Permeability: McIntosh—moderately slow; Badger—slow
Available water capacity: High
Organic matter content: McIntosh—moderate; Badger—high
Surface runoff: McIntosh—slow; Badger—very slow
Other properties: The McIntosh soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Brookings soils, which are not calcareous within a depth of 16 inches; on footslopes
• The well drained Kranzburg and Vienna soils on backslopes
• The poorly drained Lamoure soils, which have fewer carbonates in the upper 16 inches than the McIntosh soil; on low flood plains

Similar inclusions:
• Soils that have more sand in the surface layer and subsoil than the McIntosh soil
• Soils that are more than 40 inches deep over glacial till

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: McIntosh—wind erosion and the high content of lime, which adversely affects the availability of plant nutrients; Badger—wetness
Management measures:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Deferred tillage when the soil is wet helps to minimize surface compaction on the Badger soil.

Interpretive Groups

Land capability classification: McIntosh—IIs-4; Badger—IIw-1
Range site: McIntosh—Limy Subirrigated; Badger—Loamy Overflow
Windbreak suitability group: McIntosh—1; Badger—2
Pasture suitability group: McIntosh—F; Badger—A

Mn—Minnewaukan loamy sand

Composition

Minnewaukan and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

Setting

Landform: Beach terraces
Landform position: Toeslopes
Slope range: 0 to 3 percent
Shape of areas: Irregular
Size of areas: 10 to 30 acres

Typical Profile

Surface layer:
0 to 5 inches—dark gray loamy sand

Transitional layer:
5 to 9 inches—gray, calcareous loamy sand

Underlying layer:
9 to 17 inches—grayish brown, light brownish gray, and gray, calcareous sand
17 to 60 inches—light brownish gray, calcareous sand and fine sand

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy material
Seasonal high water table: 0.5 foot above to 1.5 feet below the surface
Flooding: Occasional for long periods
Permeability: Rapid
Available water capacity: Low
Organic matter content: Moderately low
Surface runoff: Very slow
Other properties: In some areas, ponding occurs in a cyclic pattern in which the soil may be ponded for several years and then not ponded for many years.

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils, which have more silt and less sand throughout than the Minnewaukan soil; on toeslopes
• The somewhat poorly drained Mauvais soils, which have more clay and less sand throughout than the Minnewaukan soil; on toeslopes
• The poorly drained Oldham and very poorly drained Southam soils in basins

Similar inclusions:
• Soils that have more than 15 percent gravel

Use and Management

Cropland

Main crops: Barley, oats, and spring wheat
Management concerns: Wind erosion, wetness
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage, leaving crop residue on the surface, and including grasses and legumes in the cropping system help to control erosion and maintain the content of organic matter.
• Wind stripcropping and field windbreaks help to control wind erosion.

Interpretive Groups

Land capability classification: IVw-1
Range site: Subirrigated
Windbreak suitability group: 2
Pasture suitability group: A

Mz—Moritz-Lamoure complex

Composition

Moritz and similar soils: 40 to 60 percent
Lamoure and similar soils: 30 to 50 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Flood plains
Landform position: Moritz—high flood plains; Lamoure—low flood plains
Slope range: Moritz—0 to 2 percent; Lamoure—0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 50 acres

Typical Profile

Moritz

Surface layer:
0 to 9 inches—dark gray, calcareous loam

Transitional layer:
9 to 13 inches—dark gray and light brownish gray, calcareous clay loam

Subsoil:
13 to 44 inches—light brownish gray, calcareous loam
44 to 54 inches—light olive gray, mottled, calcareous loam

Underlying layer:
54 to 60 inches—light olive gray, mottled, calcareous, stratified loam and sandy loam

Lamoure

Surface soil:
0 to 35 inches—very dark gray and dark gray, calcareous silty clay loam

Underlying layer:
35 to 60 inches—olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Moritz—somewhat poorly drained; Lamoure—poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: Moritz—40 to more than 60 inches over gravelly material; Lamoure—40 to more than 60 inches over sandy or gravelly material
Seasonal high water table: Moritz—at a depth of 1.5 to 3.0 feet; Lamoure—at the surface to 1.5 feet below the surface
Flooding: Moritz—occasional for brief periods; Lamoure—frequent for brief periods
Ponding: None
Permeability: Moritz—moderate; Lamoure—moderately slow
Available water capacity: High
Organic matter content: Moritz—moderate; Lamoure—high
Surface runoff: Moritz—slow; Lamoure—very slow
Other properties: Both soils have a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Castlewood soils, which have more clay and less sand in the subsoil than the major soils; on low flood plains
• The somewhat poorly drained Divide soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The moderately well drained La Prairie soils on high flood plains
• The poorly drained Lowe soils, which have more sand than the Lamoure soil; on low flood plains

Similar inclusions:
• Soils that have more salts in the surface layer and subsoil than the Lamoure soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Wetness, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In wet years these soils are better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soils are wet maintain tilth, minimize surface compaction, and help to control wind erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Moritz—IIs-4; Lamoure—IVw-3
Range site: Moritz—Limy Subirrigated; Lamoure—Subirrigated
Windbreak suitability group: Moritz—1; Lamoure—2
Pasture suitability group: Moritz—K; Lamoure—B1

Oh—Oldham silty clay loam

Composition

Oldham and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 80 acres

Typical Profile

Surface layer:
0 to 9 inches—dark gray, calcareous silty clay loam

Subsoil:
9 to 24 inches—gray, calcareous silty clay loam
24 to 44 inches—gray and light olive gray, mottled, calcareous silty clay that has accumulations of gypsum in the upper part

Underlying layer:
44 to 60 inches—gray and light olive gray, mottled, calcareous silty clay loam

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till
Depth to seasonal high water table: 0.5 foot to 1.5 feet
Flooding: None
Ponding: Occasional for brief periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils, which have more silt and less sand throughout than the Oldham soil; on toeslopes
• The somewhat poorly drained Mauvais soils, which have more sand and less silt throughout than the Oldham soil; on toeslopes
• The poorly drained Playmoor soils, which have more salt in the surface layer and subsoil than the Oldham soil; in basins
• The very poorly drained Southam soils, which are ponded throughout the growing season; in basins

Similar inclusions:
• Soils that are not calcareous near the surface
• Soils that have less clay

Use and Management

Crops and grazing

Main crops: Undrained areas—unsuited to crops; drained areas—corn and soybeans
Management concerns: Wetness and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In undrained areas proper grazing management helps to maintain plant vigor. In drained areas deferred tillage when the soil is wet helps to minimize surface compaction.
• Restricting grazing during wet periods also helps to minimize surface compaction.
• Maintaining existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: Vw-2
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B2

Or—Orthents, gravelly

Composition

Orthents and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Excavations and spoil areas
Slope range: 0 to 60 percent
Shape of areas: Irregular
Size of areas: 5 to 80 acres

General Description

• The pit bottoms are typically sand and gravel, but they are loamy or silty glacial till where all of the sand and gravel has been removed. Mounds of mixed loamy overburden are on the edges of areas. The bottoms and sides support little or no vegetation during periods when gravel is being removed.

Soil Properties and Qualities

Drainage class: Excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 0 to 10 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Very rapid
Available water capacity: Very low
Organic matter content: Low
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• Areas of loamy Orthents where all of the gravelly material has been removed
• Areas that have a water table near the surface
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; in undisturbed areas on footslopes
• The somewhat excessively drained Renshaw soils, which have gravelly material at a depth of 14 to 20 inches; in undisturbed areas

Similar inclusions:
• Soils that have 7 to 12 inches of loamy topsoil over gravelly material; in reclaimed areas

Use and Management

Major uses: Most areas of this unit are gravel pits used mainly as a source of sand and gravel for construction purposes. Some areas provide limited wildlife habitat. Abandoned gravel pits can be restored to range, tame pasture, or cropland if reclamation measures are applied.
Suitability: Unsuited to crops because of the very low available water capacity
Management measures:
• Shaping areas of this unit can reduce the slope.
• The mounds of overburden can be used as topsoil dressing.
• Proper grazing management helps to maintain vigor, conserves moisture, and helps to control erosion.
• Applying fertilizer as needed helps to establish range or pasture plantings.

Interpretive Groups

Land capability classification: VIIIs-1
Range site: Very Shallow
Windbreak suitability group: 10
Pasture suitability group: NS

Pa—Parnell silty clay loam

Composition

Parnell and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 50 acres

Typical Profile

Surface soil:
0 to 18 inches—dark gray silty clay loam; mottled in the upper part

Subsoil:
18 to 38 inches—gray silty clay

Underlying layer:
38 to 49 inches—gray silty clay
49 to 60 inches—light olive gray, mottled silty clay

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Seasonal high water table: 1.0 foot above to 0.5 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils, which have less clay in the subsoil than the Parnell soil and are calcareous at or near the surface; on toeslopes
• The somewhat poorly drained Cubden soils, which have less clay in the subsoil than the Parnell soil and are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in the shallower parts of the basins

Similar inclusions:
• Soils that are calcareous to the surface

Use and Management

Crops and grazing

Suitability: Generally not used for crops
Management concerns: Wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Vw-2
Range site: Shallow Marsh
Windbreak suitability group: 10
Pasture suitability group: B2

Pm—Playmoor silty clay loam

Composition

Playmoor and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Surface layer:
0 to 8 inches—very dark gray, calcareous silty clay loam that has accumulations of salt

Subsoil:
8 to 30 inches—dark gray and gray, calcareous silt loam that has accumulations of gypsum and other salts

Underlying layer:
30 to 44 inches—light olive gray, mottled, calcareous silty clay loam that has accumulations of gypsum
44 to 60 inches—light gray, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over glacial till or gravelly material
Seasonal high water table: At the surface to 1.5 feet below the surface
Flooding: Frequent for brief periods
Ponding: None
Permeability: Moderately slow
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil is saline and has a high content of lime.

Inclusions

Contrasting inclusions:
• Castlewood soils, which have more clay than the Playmoor soil; on low flood plains
• Lamoure, Lowe, and Rauville soils, which have fewer salts in the surface layer than the Playmoor soil; on low flood plains

Similar inclusions:
• Soils that are more stratified
• Soils that have more clay

Use and Management

Crops and pasture

Main crops: Barley, corn, oats, and soybeans
Management concerns: Wetness, salinity, wind erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• In most years this soil is better suited to late-planted crops than to some other crops. Leaving crop residue on the surface and deferring tillage when the soil is wet maintain tilth, minimize surface compaction, and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.
• Salt-tolerant crops or grasses should be planted.
• Maintaining existing drainage systems helps to remove excess water.
• Permanent pasture or hayland species should be established.

Interpretive Groups

Land capability classification: IVw-4
Range site: Saline Subirrigated
Windbreak suitability group: 10
Pasture suitability group: J

PoB—Poinsett-Buse complex, 2 to 6 percent slopes

Composition

Poinsett and similar soils: 50 to 75 percent
Buse and similar soils: 20 to 45 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and backslopes; Buse—shoulder slopes
Slope range: Poinsett—2 to 6 percent; Buse—3 to 6 percent
Shape of areas: Irregular
Size of areas: 4 to 100 acres

Typical Profile

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Buse—more than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow
Available water capacity: High
Organic matter content: Poinsett—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes
• The very poorly drained Parnell and poorly drained Tonka soils in basins
• The moderately well drained Waubay soils, which are dark to a depth of more than 16 inches; on footslopes

Similar inclusions:
• Soils that have more sand and less silt between the depths of 20 and 40 inches than the Poinsett soil
• Soils that have more silt throughout than the Buse soil

Use and Management

Cropland

Main crops: Barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Buse—IIIe-6
Range site: Poinsett—Silty; Buse—Thin Upland
Windbreak suitability group: Poinsett—3; Buse—8
Pasture suitability group: Poinsett—F; Buse—G

PsB—Poinsett-Buse-Waubay complex, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 35 to 50 percent
Buse and similar soils: 20 to 30 percent
Waubay and similar soils: 15 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and backslopes; Buse—shoulder slopes; Waubay—footslopes
Slope range: Poinsett—2 to 6 percent; Buse—3 to 6 percent; Waubay—1 to 2 percent
Shape of areas: Irregular
Size of areas: 10 to 2,000 acres

Typical Profile

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Waubay

Surface soil:
0 to 14 inches—dark gray silty clay loam

Subsoil:
14 to 22 inches—dark grayish brown silty clay loam
22 to 29 inches—brown silty clay loam
29 to 48 inches—light yellowish brown, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Buse—more than 60 inches; Waubay—40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: Poinsett—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Organic matter content: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Poinsett—medium; Buse—medium; Waubay—slow
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes at the edge of basins
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand and less silt between the depths of 10 and 40 inches than the Poinsett soil
• Soils that have more silt throughout than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—slight
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control wind erosion and water erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Buse—IIIe-6; Waubay—I-3
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PsC—Poinsett-Buse-Waubay complex, 2 to 9 percent slopes

Composition

Poinsett and similar soils: 30 to 50 percent
Buse and similar soils: 20 to 40 percent
Waubay and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Poinsett—backslopes; Buse—shoulder slopes; Waubay—footslopes
Slope range: Poinsett—6 to 9 percent; Buse—6 to 9 percent; Waubay—2 to 6 percent
Shape of areas: Irregular
Size of areas: 4 to 100 acres

Typical Profile

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Waubay

Surface soil:
0 to 14 inches—dark gray silty clay loam

Subsoil:
14 to 22 inches—dark grayish brown silty clay loam
22 to 29 inches—brown silty clay loam
29 to 48 inches—light yellowish brown, calcareous silty loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Buse—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Poinsett—40 to more than 60 inches over loamy glacial till; Buse—more than 60 inches; Waubay—40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: Poinsett—more than 6 feet; Buse—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Poinsett—moderate; Buse—moderately slow; Waubay—moderate
Available water capacity: High
Organic matter content: Poinsett—high; Buse—moderately low; Waubay—high
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime. Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes at the edge of basins
• The very poorly drained Parnell and poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand between the depths of 10 and 40 inches than the Poinsett soil
• Soils that have more silt throughout than the Buse soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients; Waubay—water erosion
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion. Including grasses and legumes in the rotation helps to control wind erosion and water erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Poinsett—IIIe-2; Buse—IVe-2; Waubay—IIe-1
Range site: Poinsett—Silty; Buse—Thin Upland; Waubay—Silty
Windbreak suitability group: Poinsett—3; Buse—8; Waubay—1
Pasture suitability group: Poinsett—F; Buse—G; Waubay—K

PwA—Poinsett-Waubay silty clay loams, 0 to 2 percent slopes

Composition

Poinsett and similar soils: 50 to 70 percent
Waubay and similar soils: 25 to 40 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and backslopes; Waubay—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 100 acres

Typical Profile

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Waubay

Surface soil:
0 to 14 inches—dark gray silty clay loam

Subsoil:
14 to 22 inches—dark grayish brown silty clay loam
22 to 29 inches—brown silty clay loam
29 to 48 inches—light yellowish brown, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• Buse soils, which are calcareous at or near the surface; on shoulder slopes
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes at the edge of basins

Similar inclusions:
• Soils that have more sand between the depths of 10 and 40 inches than the Poinsett soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Poinsett—I-2; Waubay—I-3
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1
Pasture suitability group: Poinsett—F; Waubay—K

PwB—Poinsett-Waubay silty clay loams, 1 to 6 percent slopes

Composition

Poinsett and similar soils: 65 to 80 percent
Waubay and similar soils: 15 to 30 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Poinsett—summits and backslopes; Waubay—footslopes
Slope range: Poinsett—2 to 6 percent; Waubay—1 to 2 percent

Shape of areas: Irregular
Size of areas: 4 to 150 acres

Typical Profile

Poinsett

Surface layer:
0 to 9 inches—dark gray silty clay loam

Subsoil:
9 to 18 inches—grayish brown silty clay loam
18 to 25 inches—light yellowish brown, calcareous silt loam

Underlying layer:
25 to 58 inches—light yellowish brown, calcareous silt loam
58 to 60 inches—light gray, calcareous loam

Waubay

Surface soil:
0 to 14 inches—dark gray silty clay loam

Subsoil:
14 to 22 inches—dark grayish brown silty clay loam
22 to 29 inches—brown silty clay loam
29 to 48 inches—light yellowish brown, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Poinsett—well drained; Waubay—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: Poinsett—more than 6 feet; Waubay—3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Poinsett—medium; Waubay—slow
Other properties: Runoff water flows over the Waubay soil during periods of rainfall and snowmelt.

Inclusions

Contrasting inclusions:
• Buse soils, which are calcareous at or near the surface; on shoulder slopes
• The poorly drained Tonka soils in basins
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes at the edge of basins

Similar inclusions:
• Soils that have more sand between the depths of 10 and 40 inches than the Poinsett soil

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Poinsett—water erosion; Waubay—slight
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but the slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Poinsett—IIe-3; Waubay—I-3
Range site: Poinsett—Silty; Waubay—Loamy Overflow
Windbreak suitability group: Poinsett—3; Waubay—1
Pasture suitability group: Poinsett—F; Waubay—K

Ra—Rauville silty clay loam

Composition

Rauville and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Flood plains
Landform position: Low flood plains
Slope range: 0 to 1 percent
Shape of areas: Long and narrow
Size of areas: 5 to 50 acres

Typical Profile

Surface layer:
0 to 9 inches—gray, calcareous silty clay loam

Subsurface layer:
9 to 37 inches—gray and very dark gray, calcareous silt loam and silty clay loam

Underlying layer:
37 to 60 inches—gray, mottled, calcareous silty clay

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over gravelly material
Seasonal high water table: At the surface to 0.5 foot below the surface
Flooding: Frequent for long periods
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Very slow
Other properties: This soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils, which are calcareous at or near the surface and have gravelly material at a depth of 20 to 40 inches; on footslopes
• The poorly drained Lamoure soils on low flood plains
• The poorly drained Marysland soils, which have gravelly material at a depth of 20 to 40 inches; on toeslopes
• The poorly drained Playmoor soils, which have salts at or near the surface; on low flood plains

Similar inclusions:
• Soils that have more sand
• Soils that have more clay

Use and Management

Wildlife habitat or range

Management concerns: Wetness
Management measures:
• Proper grazing management helps to maintain plant vigor.
• Restricting grazing during wet periods helps to minimize surface compaction.

Interpretive Groups

Land capability classification: Vw-1
Range site: Wetland
Windbreak suitability group: 10
Pasture suitability group: B1

ReA—Renshaw loam, 0 to 2 percent slopes

Composition

Renshaw and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 30 acres

Typical Profile

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 14 to 20 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Organic matter content: Moderate
Surface runoff: Slow

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils, which are calcareous at or near the surface and have gravelly material at a depth of 20 to 40 inches; on footslopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
• The somewhat poorly drained Spottswood soils on toeslopes

Similar inclusions:
• Soils that have more sand and less clay in the surface layer and subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Low available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture (fig. 7).
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IIIs-3
Range site: Shallow to Gravel
Windbreak suitability group: 6
Pasture suitability group: D2

ReB—Renshaw loam, 2 to 6 percent slopes

Composition

Renshaw and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 4 to 50 acres

Typical Profile

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: 14 to 20 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Low
Organic matter content: Moderate
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Divide soils, which are calcareous at or near the surface and have gravelly material at a depth of 20 to 40 inches; on footslopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes
• The somewhat poorly drained Spottswood soils, which have gravelly material at a depth of 20 to 40 inches; on toeslopes

Similar inclusions:
• Soils that have more sand and less clay in the surface layer and subsoil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Low available water capacity, water erosion
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: IVs-2
Range site: Shallow to Gravel
Windbreak suitability group: 6
Pasture suitability group: D2

Figure 7.—Fall chiseling of cornstalks leaves an adequate ground cover in this area of Renshaw loam, 0 to 2 percent slopes. Photo courtesy of Beth Lantgen.

RnC—Renshaw-Brandt complex, 3 to 9 percent slopes

Composition

Renshaw and similar soils: 45 to 55 percent
Brandt and similar soils: 20 to 45 percent
Contrasting inclusions: 10 to 15 percent

Setting

Landform: Moraines
Landform position: Renshaw—shoulder slopes and summits; Brandt—backslopes
Slope range: Renshaw—6 to 9 percent; Brandt—3 to 6 percent
Shape of areas: Irregular
Size of areas: 5 to 25 acres

Typical Profile

Renshaw

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Brandt

Surface layer:
0 to 8 inches—dark gray silty clay loam

Subsoil:
8 to 32 inches—dark grayish brown, brown, and yellowish brown silty clay loam and silt loam

32 to 42 inches—light yellowish brown, calcareous silt loam
42 to 49 inches—light yellowish brown, calcareous gravelly loam

Underlying layer:
49 to 60 inches—pale yellow, calcareous gravelly loamy sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Brandt—well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Brandt—40 to 60 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Brandt—moderate in the silty sediments and very rapid in the underlying gravelly material
Available water capacity: Renshaw—low; Brandt—high
Organic matter content: Renshaw—moderate; Brandt—high
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The well drained Kranzburg soils, which are not underlain by gravelly material within a depth of 10 inches; on backslopes
• The well drained Poinsett soils, which are not underlain by gravelly material within a depth of 60 inches; on backslopes
• The excessively drained Sioux soils, which have gravelly material within a depth of 14 inches; on shoulder slopes

Similar inclusions:
• Soils that have more sand and less clay in the surface layer and subsoil than the Renshaw soil

Use and Management

Cropland

Main crops: Barley, corn, oats, soybeans, and spring wheat
Management concerns: Renshaw—water erosion, low available water capacity; Brandt—water erosion
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture and help to control erosion. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to control erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Renshaw—IVe-4; Brandt—IIe-3
Range site: Renshaw—Shallow to Gravel; Brandt—Silty
Windbreak suitability group: Renshaw—6; Brandt—3
Pasture suitability group: Renshaw—D2; Brandt—F

RsC—Renshaw-Sioux complex, 6 to 9 percent slopes

Composition

Renshaw and similar soils: 50 to 65 percent
Sioux and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Outwash plains
Landform position: Renshaw—backslopes; Sioux—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 4 to 30 acres

Typical Profile

Renshaw

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Underlying layer:
7 to 14 inches—brown, calcareous very gravelly sandy loam
14 to 60 inches—yellowish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Renshaw—somewhat excessively drained; Sioux—excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Renshaw—14 to 20 inches over gravelly material; Sioux—6 to 14 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material; Sioux—very rapid
Available water capacity: Renshaw—low; Sioux—very low
Organic matter content: Renshaw—moderate; Sioux—moderately low
Surface runoff: Renshaw—medium; Sioux—slow

Inclusions

Contrasting inclusions:
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes
• The well drained Buse soils, which are not underlain by gravelly material; on shoulder slopes

Similar inclusions:
• Soils that have more sand and less clay in the surface layer and subsoil than the Renshaw soil
• Soils that have less than 30 percent gravel

Use and Management

Crops and pasture

Main crops: Renshaw—alfalfa, barley, oats, and spring wheat; Sioux—unsuited to crops
Management concerns: Renshaw—low available water capacity, water erosion; Sioux—very low available water capacity, water erosion
Management measures:
• These soils are better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface help to control water erosion, conserve moisture, and maintain the content of organic matter.
• Including grasses and legumes in the rotation helps to control water erosion and maintains tilth and the content of organic matter.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Renshaw—IVe-4; Sioux—VIs-3
Range site: Renshaw—Shallow to Gravel; Sioux—Very Shallow
Windbreak suitability group: Renshaw—6; Sioux—10
Pasture suitability group: Renshaw—D2; Sioux—NS

SaD—Sioux-Renshaw complex, 9 to 15 percent slopes

Composition

Sioux and similar soils: 40 to 65 percent
Renshaw and similar soils: 30 to 55 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Moraines
Landform position: Sioux—shoulder slopes; Renshaw—backslopes
Slope range: 9 to 15 percent
Shape of areas: Irregular
Size of areas: 5 to 20 acres

Typical Profile

Sioux

Surface layer:
0 to 7 inches—dark gray, calcareous gravelly loam

Underlying layer:
7 to 14 inches—brown, calcareous very gravelly sandy loam
14 to 60 inches—yellowish brown, calcareous very gravelly sand

Renshaw

Surface soil:
0 to 11 inches—dark gray loam

Subsoil:
11 to 17 inches—brown loam

Underlying layer:
17 to 60 inches—grayish brown, calcareous very gravelly sand

Soil Properties and Qualities

Drainage class: Sioux—excessively drained; Renshaw—somewhat excessively drained
Depth to bedrock: Very deep
Depth to contrasting layer: Sioux—6 to 14 inches over

gravelly material; Renshaw—14 to 20 inches over gravelly material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Sioux—very rapid; Renshaw—moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Sioux—very low; Renshaw—low
Organic matter content: Sioux—moderately low; Renshaw—moderate
Surface runoff: Sioux—slow; Renshaw—rapid

Inclusions

Contrasting inclusions:
• The moderately well drained Svea soils, which are dark to a depth of more than 16 inches and are not underlain by gravelly material within a depth of 60 inches; on footslopes
• The well drained Buse soils, which are not underlain by gravelly material; on shoulder slopes
• The well drained Barnes soils, which are not underlain by gravelly material; on backslopes
• The well drained Fordville soils, which have gravelly material at a depth of 20 to 40 inches; on footslopes

Similar inclusions:
• Soils that have more sand in the surface layer than the Renshaw soil

Use and Management

Crops and grazing

Suitability: Unsuited to crops
Management concerns: Sioux—water erosion, very low available water capacity; Renshaw—water erosion, low available water capacity
Management measures:
• Proper grazing management helps to maintain plant vigor, conserves moisture, and helps to control erosion.
• Seeding cultivated areas to adapted grasses helps to control erosion.

Interpretive Groups

Land capability classification: Sioux—VIs-3; Renshaw—VIe-6
Range site: Sioux—Very Shallow; Renshaw—Shallow to Gravel
Windbreak suitability group: Sioux—10; Renshaw—10
Pasture suitability group: Sioux—NS; Renshaw—NS

So—Southam silty clay loam

Composition

Southam and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 100 acres

Typical Profile

Surface layer:
0 to 6 inches—very dark gray, calcareous silty clay loam

Subsurface layer:
6 to 48 inches—gray, mottled, calcareous silty clay that has snail-shell fragments

Underlying layer:
48 to 60 inches—light olive gray, mottled, calcareous silty clay that has accumulations of gypsum

Soil Properties and Qualities

Drainage class: Very poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Seasonal high water table: 5 feet above to 1 foot below the surface
Flooding: None
Ponding: Frequent for very long periods
Permeability: Slow
Available water capacity: High
Organic matter content: Very high
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The poorly drained Colvin soils, which have more silt and less clay in the subsoil than the Southam soil; on toeslopes
• The poorly drained Mauvais soils, which have more sand and less clay throughout than the Southam soil; on toeslopes
• The poorly drained Minnewaukan soils, which have more sand in the surface layer than the Southam soil; on beaches

Similar inclusions:
• Soils that are not dark to a depth of more than 24 inches

- Soils that are ponded for shorter periods
- Soils that are leached to a greater depth

Use and Management

Crops and wildlife habitat

Suitability: Unsuited to crops because of the wetness
Management measures:
- Areas of this soil can be maintained as wildlife habitat.

Interpretive Groups

Land capability classification: VIIIw-1
Range site: Not assigned
Windbreak suitability group: 10
Pasture suitability group: NS

Sp—Spottswood loam

Composition

Spottswood and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 15 acres

Typical Profile

Surface layer:
0 to 8 inches—dark gray loam

Subsoil:
8 to 18 inches—very dark gray clay loam
18 to 26 inches—grayish brown, mottled clay loam

Underlying layer:
26 to 60 inches—light yellowish brown, mottled, gravelly loamy sand

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over gravelly material
Depth to seasonal high water table: 1.5 to 3.0 feet
Flooding: Occasional for brief periods
Ponding: None
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Slow

Inclusions

Contrasting inclusions:
- The poorly drained Castlewood soils, which are more than 40 inches deep over gravelly material; on low flood plains
- The somewhat poorly drained Divide soils, which are calcareous at or near the surface; on footslopes
- The well drained Fordville soils on summits
- The poorly drained Lamoure soils, which are more than 40 inches deep over gravelly material; on low flood plains

Similar inclusions:
- Soils that are poorly drained

Use and Management

Cropland

Main crops: Barley, corn, oats, soybeans, and spring wheat
Management concerns: Moderate available water capacity
Management measures:
- This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture.
- Including grasses and legumes in the rotation helps to maintain tilth and the content of organic matter.
- Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.

Interpretive Groups

Land capability classification: IIs-3
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

StB—Strayhoss loam, 2 to 6 percent slopes

Composition

Strayhoss and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Outwash plains
Landform position: Summits and backslopes
Slope range: 2 to 6 percent
Shape of areas: Irregular
Size of areas: 4 to 20 acres

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown loam

Subsoil:
7 to 13 inches—brown loam
13 to 30 inches—light olive brown and light yellowish brown silt loam
30 to 36 inches—light olive brown, calcareous loam

Underlying layer:
36 to 60 inches—pale yellow and light gray, calcareous loamy sand stratified with thin lenses of sandy loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 20 to 40 inches over sandy material
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderate in the loamy sediments and rapid in the underlying sandy material
Available water capacity: Moderate
Organic matter content: High
Surface runoff: Medium

Inclusions

Contrasting inclusions:
• The well drained Egeland soils, which have more sand and less silt in the surface layer and subsoil than the Strayhoss soil; on backslopes
• The well drained Maddock soils, which have more sand and less silt in the surface layer and subsoil than the Strayhoss soil; on shoulder slopes
• The well drained Poinsett soils, which do not have sandy material within a depth of 40 inches; on backslopes

Similar inclusions:
• Soils that have coarse fragments in the underlying layer

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Water erosion, moderate available water capacity
Management measures:
• This soil is better suited to early maturing crops, such as small grain, than to some other crops. Minimizing tillage and leaving crop residue on the surface conserve moisture. Contour farming and grassed waterways help to control water erosion.
• Including grasses and legumes in the rotation helps to maintain tilth and the content of organic matter.
• Irrigation helps to overcome the limited ability of the soil to store water if an adequate and dependable supply of water is available.

Interpretive Groups

Land capability classification: IIe-2
Range site: Silty
Windbreak suitability group: 3
Pasture suitability group: F

To—Tonka silty clay loam

Composition

Tonka and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Basins
Slope range: 0 to 1 percent
Shape of areas: Oval
Size of areas: 4 to 15 acres

Typical Profile

Surface layer:
0 to 10 inches—very dark gray silty clay loam

Subsurface layer:
10 to 18 inches—gray, mottled silt loam

Subsoil:
18 to 40 inches—dark gray silty clay
40 to 45 inches—grayish brown and light brownish gray silty clay

Underlying layer:
45 to 60 inches—light gray, mottled silty clay loam

Soil Properties and Qualities

Drainage class: Poorly drained
Depth to bedrock: Very deep
Depth to contrasting layer: More than 60 inches
Seasonal high water table: 0.5 foot above to 1 foot below the surface
Flooding: None
Ponding: Frequent for long periods
Permeability: Slow

Available water capacity: High
Organic matter content: High
Surface runoff: Negligible

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils around the outer edges of some basins
• The somewhat poorly drained Cubden soils on footslopes
• The very poorly drained Parnell soils in the center of some basins
• The moderately well drained Waubay soils, which have less clay than the Tonka soil; on footslopes

Use and Management

Cropland

Main crops: Corn, soybeans
Management concerns: Wetness
Management measures:
• This soil is better suited to late-planted crops than to some other crops. Deferred tillage when the soil is wet helps to minimize surface compaction.
• Maintain existing drainage systems helps to remove excess water.

Interpretive Groups

Land capability classification: IVw-2
Range site: Wet Meadow
Windbreak suitability group: 10
Pasture suitability group: B2

VbA—Vienna-Brookings complex, 0 to 2 percent slopes

Composition

Vienna and similar soils: 65 to 75 percent
Brookings and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and backslopes; Brookings—footslopes
Slope range: 0 to 2 percent
Shape of areas: Irregular
Size of areas: 5 to 30 acres

Typical Profile

Vienna

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 16 inches—dark grayish brown silty clay loam
16 to 21 inches—grayish brown clay loam
21 to 44 inches—light yellowish brown and pale yellow, calcareous clay loam

Underlying layer:
44 to 60 inches—pale yellow, mottled, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 25 inches—dark gray silty clay loam
25 to 32 inches—light brownish gray, calcareous silty clay loam
32 to 48 inches—light gray, calcareous clay loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Depth to seasonal high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand and less silt in the surface layer and subsoil than the Vienna soil
• Soils that have more silt and less sand between the depths of 20 and 40 inches than the Vienna soil
• Soils that are more than 40 inches deep over glacial till

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Vienna—I-2; Brookings—I-3
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

VbB—Vienna-Brookings complex, 1 to 6 percent slopes

Composition

Vienna and similar soils: 65 to 75 percent
Brookings and similar soils: 10 to 20 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Vienna—summits and backslopes; Brookings—footslopes
Slope range: Vienna—2 to 6 percent; Brookings—1 to 2 percent
Shape of areas: Irregular
Size of areas: 4 to 60 acres

Typical Profile

Vienna

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 16 inches—dark grayish brown silty clay loam
16 to 21 inches—grayish brown clay loam
21 to 44 inches—light yellowish brown and pale yellow, calcareous clay loam

Underlying layer:
44 to 60 inches—pale yellow, mottled, calcareous clay loam

Brookings

Surface soil:
0 to 17 inches—very dark gray silty clay loam

Subsoil:
17 to 25 inches—dark gray silty clay loam
25 to 32 inches—light brownish gray, calcareous silty clay loam
32 to 48 inches—light gray, calcareous clay loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous clay loam

Soil Properties and Qualities

Drainage class: Vienna—well drained; Brookings—moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Brookings—20 to 40 inches over loamy glacial till
Depth to seasonal high water table: Vienna—more than 6 feet; Brookings—3 to 5 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: High
Surface runoff: Vienna—medium; Brookings—slow
Other properties: Runoff water flows over the Brookings soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The well drained Buse soils, which are calcareous at or near the surface; on shoulder slopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand and less silt in the surface layer and subsoil than the Vienna soil
• Soils that have more silt and less sand between the depths of 20 and 40 inches than the Vienna soil

• Soils that are more than 40 inches deep over glacial till

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Vienna—water erosion; Brookings—slight
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control water erosion and conserve moisture. Contour farming and grassed waterways help to control water erosion, but slopes in some areas are too short or too irregular for contour farming.
• Including grasses and legumes in the rotation helps to control wind erosion and water erosion and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: Vienna—IIe-2; Brookings—I-3
Range site: Vienna—Silty; Brookings—Loamy Overflow
Windbreak suitability group: Vienna—3; Brookings—1
Pasture suitability group: Vienna—F; Brookings—K

VnC—Vienna-Buse complex, 6 to 9 percent slopes

Composition

Vienna and similar soils: 65 to 75 percent
Buse and similar soils: 15 to 25 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Moraines
Landform position: Vienna—backslopes; Buse—shoulder slopes
Slope range: 6 to 9 percent
Shape of areas: Irregular
Size of areas: 4 to 75 acres

Typical Profile

Vienna

Surface layer:
0 to 7 inches—dark gray silt loam

Subsurface layer:
7 to 10 inches—dark gray silty clay loam

Subsoil:
10 to 16 inches—dark grayish brown silty clay loam
16 to 21 inches—grayish brown clay loam
21 to 44 inches—light yellowish brown and pale yellow, calcareous clay loam

Underlying layer:
44 to 60 inches—pale yellow, mottled, calcareous clay loam

Buse

Surface layer:
0 to 7 inches—grayish brown, calcareous loam

Subsoil:
7 to 24 inches—light gray, calcareous loam

Underlying layer:
24 to 60 inches—light yellowish brown, calcareous loam

Soil Properties and Qualities

Drainage class: Well drained
Depth to bedrock: Very deep
Depth to contrasting layer: Vienna—10 to 20 inches over loamy glacial till; Buse—more than 60 inches
Depth to seasonal high water table: More than 6 feet
Flooding: None
Ponding: None
Permeability: Moderately slow
Available water capacity: High
Organic matter content: Vienna—high; Buse—moderately low
Surface runoff: Medium
Other properties: The Buse soil has a high content of lime.

Inclusions

Contrasting inclusions:
• The moderately well drained Brookings soils, which are dark to a depth of more than 16 inches; on footslopes
• Estelline soils, which have gravelly material at a depth of 20 to 40 inches; on backslopes
• The somewhat poorly drained McIntosh soils, which are calcareous at or near the surface; on footslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand and less silt in the surface layer and subsoil than the Vienna soil
• Soils that have more silt and less sand between the depths of 20 and 40 inches than the Vienna soil

Use and Management

Cropland

Main crops: Alfalfa, corn, oats, soybeans, and spring wheat
Management concerns: Vienna—water erosion; Buse—wind erosion, water erosion, and the high content of lime, which adversely affects the availability of plant nutrients
Management measures:
• Minimizing tillage and leaving crop residue on the surface help to control erosion and conserve moisture. Contour farming, terraces, and grassed waterways help to control water erosion, but slopes in most areas are too short or too irregular for contour farming or terraces.
• Wind stripcropping and field windbreaks help to control wind erosion.
• Including grasses and legumes in the rotation helps to control wind erosion and water erosion and maintains fertility, tilth, and the content of organic matter.

Interpretive Groups

Land capability classification: Vienna—IIIe-1; Buse—IVe-2
Range site: Vienna—Silty; Buse—Thin Upland
Windbreak suitability group: Vienna—3; Buse—8
Pasture suitability group: Vienna—F; Buse—G

Wa—Waubay silty clay loam

Composition

Waubay and similar soils: 80 to 90 percent
Contrasting inclusions: 10 to 20 percent

Setting

Landform: Till plains
Landform position: Footslopes
Slope range: 0 to 2 percent
Shape of areas: Long and narrow
Size of areas: 4 to 10 acres

Typical Profile

Surface soil:
0 to 14 inches—dark gray silty clay loam

Subsoil:
14 to 22 inches—dark grayish brown silty clay loam
22 to 29 inches—brown silty clay loam
29 to 48 inches—light yellowish brown, calcareous silt loam

Underlying layer:
48 to 60 inches—pale yellow, mottled, calcareous silt loam

Soil Properties and Qualities

Drainage class: Moderately well drained
Depth to bedrock: Very deep
Depth to contrasting layer: 40 to more than 60 inches over loamy glacial till
Depth to seasonal high water table: 3.5 to 5.0 feet
Flooding: None
Ponding: None
Permeability: Moderate
Available water capacity: High
Organic matter content: High
Surface runoff: Slow
Other properties: Runoff water flows over this soil during periods of rainfall or snowmelt.

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Badger soils on toeslopes
• The somewhat poorly drained Cubden soils, which are calcareous at or near the surface; on footslopes
• The well drained Poinsett soils on summits and backslopes
• The poorly drained Tonka soils in basins

Similar inclusions:
• Soils that have more sand and less silt throughout

Use and Management

Cropland

Main crops: Alfalfa, barley, corn, oats, soybeans, and spring wheat
Management concerns: Slight
Management measures:
• Managing crop residue conserves moisture and maintains tilth and the content of organic matter.

Interpretive Groups

Land capability classification: I-3
Range site: Loamy Overflow
Windbreak suitability group: 1
Pasture suitability group: K

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber.

Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 210,500 acres in Hamlin County, or 65 percent of the total acreage, meets the soil requirements for prime farmland. Approximately 4,000 acres of this land is irrigated. Most areas of prime farmland are cropped. The main crops are corn, soybeans, small grain, and alfalfa.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit are also shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops

Dennis Shoup, conservation agronomist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops is suggested in this section. The crops best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station.

About 70 percent of the acreage in Hamlin County is used for cultivated crops (U.S. Department of Commerce, 1987). The major crops are alfalfa, corn, oats, soybeans, and spring wheat (fig. 8). Barley, buckwheat, flax, millet, rye, sunflowers, and winter wheat also are grown. Alfalfa is harvested mainly for hay; spring wheat and soybeans are grown for cash crops; and corn, oats, and barley are grown as cash crops and as livestock feed. Corn is harvested for both silage and grain.

The potential of the soils in Hamlin County for increased crop production is good. Crop production could be increased considerably by extending the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the management needed on the cropland in the county.

Water erosion reduces productivity and results in sedimentation. It is a major problem on more than half of the cropland in Hamlin County. It is a hazard on Barnes, Buse, Fordville, Kranzburg, Poinsett, Vienna, and other soils where the slope is more than

Figure 8.—Harvesting wheat in an area of Barnes clay loam, 2 to 6 percent slopes. Photo courtesy of Beth Lantgen.

2 percent. Productivity is reduced when the surface layer, which is the most fertile part of the soil, is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a thin surface layer, such as Buse soils, and on soils that tend to be droughty, such as Arvilla and Renshaw soils. As a result of erosion, sediments rich in nutrients and, possibly, pesticides enter streams, lakes, and potholes. Measures that control water erosion minimize the pollution of streams and lakes by sediment and help to maintain the quality of water for fish and other wildlife and for recreational and municipal uses. These measures also reduce the amount of fertilizer needed in cropped areas by helping to prevent the removal of plant nutrients.

A cropping sequence that keeps a plant cover on the surface for extended periods holds soil losses to an amount that will not reduce the productive capacity of the soils. If a plant cover cannot protect the soil, careful management of crop residue is essential. Minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration, reduce the runoff rate, and help to control erosion.

Terraces and diversions reduce the length of slopes and thus reduce the runoff rate and the hazard of erosion on the gently sloping and moderately sloping Barnes, Kranzburg, Poinsett, and Vienna soils. Many areas of Buse and Renshaw soils are poorly suited to terraces and diversions because of short, irregular slopes or because of an unfavorable subsoil that would be exposed in terrace channels.

Wind erosion is a slight or moderate hazard in many areas of the county. The hazard of wind erosion is greatest on the sandy Arvilla and Maddock soils and the clayey Castlewood soils. Soils that have a high content of lime in the surface layer, such as Buse, Colvin, Cubden, Divide, Lamoure, Lowe, McIntosh, Moritz, Marysland, and Oldham soils, also are highly susceptible to wind erosion. Wind erosion can damage these soils in a few hours if the winds are strong and the soils are dry and are not protected by a plant cover or surface mulch. Wind erosion can be controlled by an adequate plant cover, a cover of crop residue, stripcropping, and tillage methods that keep the surface rough. Planting windbreaks of suitable trees and shrubs also is effective in controlling wind erosion.

Information about measures that control erosion on each kind of soil is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is a major management concern in areas of the somewhat poorly drained and poorly drained Badger, Lamoure, Lowe, Marysland, Playmoor, and Tonka soils and the very poorly drained Oldham and Parnell soils. Unless a system of artificial drainage is provided, these soils are so wet that crops frequently are damaged. Maintaining existing drainage systems helps to remove excess water if a drainage outlet is available. Controlling the runoff from adjacent soils also minimizes wetness on these soils. Selecting water-tolerant crops and crops that are planted later in the season also minimizes the damage caused by wetness.

The moderately well drained Brookings, LaDelle, La Prairie, Svea, and Waubay soils are on high flood plains and footslopes that occasionally receive additional moisture when streams overflow. These soils also receive additional moisture in the form of runoff from the higher adjacent areas. In most years, natural drainage is adequate and the crops benefit from the additional moisture. During wet years, however, spring tillage and planting may be delayed.

Soil fertility helps to determine the yields that can be obtained from the soil. Fertility can be improved by applying fertilizer and by including grasses and legumes in the cropping system. In areas of soils that have a high content of lime in the surface layer, such as Buse, Colvin, Cubden, Divide, Lamoure, Lowe, Marysland, McIntosh, Moritz, Oldham, and Playmoor soils, the kinds and amounts of fertilizer applied should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The South Dakota Cooperative Extension Service and the South Dakota Agricultural Experiment Station can help in determining the kinds and amounts of fertilizer needed, the preferred application method, and the preferred time of application. The preferred methods may vary, depending on the crop, the soil, climatic conditions, and the location of the field in relation to the depth to an aquifer and the distance to a stream or lake.

Surface compaction is an important factor in soil management. It can result when important physical properties of the soil, such as pore space, are degraded. Soil compaction results from weight on the soil pushing the soil particles together. When compaction occurs in the surface layer or subsoil, aeration is impaired and plant roots have more difficulty pushing through the soil to reach water.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. If tilled when wet, Hetland soils tend to be very cloddy when they dry. As a result of the cloddiness, preparing a good seedbed is difficult. Maintaining tilth and minimizing compaction are also concerns in areas of the somewhat poorly drained and poorly drained Badger, Castlewood, Lamoure, Lowe, Playmoor, and Tonka soils. These soils commonly are wet in the spring and dry slowly. They are difficult to till. Tilth can be affected if they are cultivated during periods when the moisture content is high.

Management measures that improve soil tilth and minimize surface compaction include using high-residue crops in the rotation a high percentage of the time, preventing trampling by livestock during wet periods, deferring the use of equipment during wet periods, leaving as much residue as possible on or near the surface, and eliminating unnecessary tillage trips. The timing of farming activities is critical. If compaction has occurred, it can be reduced through ripping or deep plowing.

Field crops suited to the soils and climate of the survey area include small grain and row crops. Oats and spring wheat are the main small grain crops. Barley, flax, rye, and winter wheat are also grown. Corn and soybeans are the main row crops. Soybeans are either planted in rows or solid-seeded with a drill. Corn is grown mainly for grain, but a smaller acreage is harvested for silage. Small acreages of sunflowers are also grown.

All of the commonly grown and climatically adapted crops are suited to the very deep, well drained or moderately well drained soils, such as Barnes, Brookings, Hetland, Kranzburg, LaDelle, La Prairie, Poinsett, Vienna, and Waubay soils. Arvilla, Estelline, Fordville, and Renshaw soils are better suited to early maturing small grain than to the deeper rooted, late maturing crops, such as corn and alfalfa. The porous underlying material in these soils limits the available water capacity and the depth to which roots can develop. Arvilla, Egeland, and Maddock soils also are better suited to small grain, which provides better protection against wind erosion than row crops.

Pasture and Hayland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Pasture and hayland are used for the production of adapted domesticated perennial forage plants to be grazed by livestock or harvested for hay. These

forage plants may be either native or introduced species and may be seeded alone or in mixtures. Generally, these species are established as part of a long-term forage program, but in some areas legumes or grasses have been established as part of a short-term crop rotation.

About 13 percent of the county is classified as pasture and hayland (USDA, 1987). This acreage supplies a major portion of the forage for livestock. It includes areas that formerly supported native vegetation but have been invaded by introduced tame grasses, such as smooth bromegrass, because of overgrazing. Managing these sites as native rangeland is no longer practical in many cases. Because of overgrazing, improper management, and poor agronomic practices, much of the pasture or hayland is presently producing well below its potential.

Proper management of pasture and hayland is needed to obtain sustained maximum yields. Proper stocking rates allow the pasture plants to retain their vigor. Overgrazing results in depletion of the root systems of the pasture plants. If continued overgrazing is allowed, the plants will eventually die out and be replaced by less desirable species and by weeds. A planned grazing system that includes periods of adequate rest or deferment for the key pasture species improves plant vigor and thus improves production. Including rest periods between periods of grazing allows the pasture plants to regrow and replenish their energy reserves. Harvesting hay crops at the proper stage of plant growth also helps to maintain plant vigor. Generally, the plants should be allowed to grow to early or mid bloom stage before they are harvested. Grazing pasture species at the proper stage of growth also increases production. The plants should not be grazed before they have produced enough leaf material to replenish stored energy reserves. Generally, the plants should be allowed to grow to a height of 8 to 14 inches before grazing is allowed. The proper height depends on the species being managed. If the plants become too tall or mature before grazing is allowed, the quality and quantity of the forage can be affected. Also, allowing the plants to regrow before the first killing frost provides adequate energy reserves for survival through the winter and for the initiation of regrowth in the spring. Allowing regrowth also increases the ability of the plants to trap snow, thereby increasing soil moisture.

Pasture and hayland species can be divided into two broad categories. Cool-season species begin their growth in the early spring and reach maturity in early summer. If soil moisture is adequate, they may regrow in the fall when temperatures cool. Warm-season species begin growth in the early summer. They produce most of their forage during the hot summer months. Cool-season plants include smooth bromegrass, intermediate wheatgrass, and alfalfa. Warm-season species include big bluestem and switchgrass. Selecting a warm-season species will ensure a productive, nutritious forage source for livestock during July and August. Using a cool-season species during this same period would produce less forage.

Proper management includes the periodic reestablishment of pasture and hayland. The length of time that pasture and hayland remain productive depends on the plant species, the type of soil, climatic factors, and management techniques. Generally, many of the tame species should be replaced every 5 to 10 years. Native species that are adapted to the site generally remain productive for an extended period of time, depending on the kind of management applied. Species selection should be based on the type of soil and on producer needs. Using improved varieties can result in increased production, improved forage quality, and improved stand establishment and longevity of the stands.

Maintaining soil fertility is an important management concern. Applications of fertilizer should be based on the results of soil tests. Care should be taken to prevent the contamination of water supplies. Proper levels of fertilizer can increase production, increase the longevity of the stand, and improve the quality of forage. Planting legumes, such as alfalfa, in combination with grasses increases the nitrogen level and thus helps to meet the nutrient needs of grass species.

Weeds can be a problem if proper management techniques are not applied. Allowing overgrazing, selecting species that are not adapted to the site, and failing to maintain soil fertility can increase the extent of weeds in areas of pasture and hayland.

At the end of each map unit description and in the section “Interpretive Groups,” the soil has been assigned to a pasture suitability group. These groups are based primarily on the suitability of the soil for certain pasture or hayland species, management needs, and potential productivity. The principal criteria for assigning a soil to a pasture suitability group include depth, drainage class, texture, structure, permeability, available water capacity, landscape position, and special internal features. Detailed interpretations for each pasture suitability group in the county are provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service. General

descriptions of the pasture suitability groups in this county are provided in the following paragraphs. The descriptions include limitations affecting the use of the soils for pasture or hayland and a list of suitable plant species. The species are selected based on yield potential, adaptability to the site, palatability, and relative ease of establishment.

Group A.—The soils in this group receive additional moisture from runoff or flooding. All climatically adapted grasses and legumes are suitable, but only plants that are capable of utilizing the extra moisture are recommended.

The soils in this group are artificially drained or have a water table that is seasonally high for only short periods. Examples are Badger, Lowe, Mauvais, and Minnewaukan soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, smooth bromegrass, orchardgrass, and switchgrass. Maintaining plant vigor and maintaining good soil tilth are the major management concerns. Proper grazing use, including deferred grazing and timely harvesting, helps to maintain plant vigor. Applications of fertilizer may also be needed. Surface compaction may be a concern during wet periods. Deferring use during these periods helps to minimize compaction.

Group B1.—The soils in this group receive additional moisture from runoff or flooding. Because of the excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained and do not have a water table that is seasonally high for prolonged periods. Examples are Castlewood, Colvin, Marysland, and Rauville soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The main management concern is surface compaction, which can result from harvesting or grazing during periods when the soils are saturated. Deferred grazing or haying during these periods can minimize compaction and improve plant vigor.

Group B2.—The soils in this group receive additional moisture from runoff. Because of the excess moisture, the selection of climatically adapted grasses is limited to water-tolerant species.

The soils in this group are not artificially drained. Examples are Oldham, Parnell, and Tonka soils. The species that are most suitable in areas of these soils include creeping foxtail and reed canarygrass. The major management concern is the likelihood of saturated soil conditions, which can result in surface compaction. Deferred grazing or haying during wet periods can minimize compaction and improve plant vigor.

Group D1.—The soils in this group have a moderately deep root zone and a limited available water capacity, which restrict the selection of climatically adapted grasses and legumes.

The soils in this group are excessively drained to somewhat poorly drained and are moderately deep over sand and gravel. The somewhat poorly drained soils and some of the moderately well drained soils have a water table that is seasonally high for short periods and are calcareous at or near the surface. Typical soils in this group include Divide, Estelline, and Fordville soils. The species that are most suitable in areas of these soils include alfalfa, intermediate wheatgrass, and smooth bromegrass. The major management concerns are overcoming droughtiness, which is caused by the limited available water capacity, and maintaining plant vigor. Proper hayland management and proper grazing use, including deferred grazing or a planned grazing system, help to maintain plant vigor. Applications of fertilizer may also be needed.

Group D2.—The soils in this group have a shallow root zone and a very low available water capacity, which limit the selection of climatically adapted grasses.

The soils in this group are excessively drained to moderately well drained and are shallow over sand and gravel. Arvilla and Renshaw soils are examples. The species that are most suitable in areas of these soils include crested wheatgrass and pubescent wheatgrass. Maintaining the plant community can be difficult because of the extreme droughtiness and the shallow root zone. Proper grazing use, deferred grazing, a planned grazing system, and timely harvesting help to maintain plant vigor.

Group F.—The soils in this group are suited to all climatically adapted grasses and legumes, but bunch-type grass species are not recommended in areas where the slope is 6 percent or more.

The soils in this group include Barnes, Brandt, Cubden, Hetland, Kranzburg, McIntosh, Poinsett, Strayhoss, and Vienna soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, green needlegrass, indiangrass, intermediate wheatgrass, smooth bromegrass, switchgrass, and orchardgrass. The major management concerns are maintaining plant vigor and maintaining good tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor, help to maintain tilth, and help to prevent surface

compaction. Applications of fertilizer may also be needed.

Group G.—The soils in this group are calcareous within a depth of 10 inches. They range from gently sloping to moderately steep. The selection and productivity of climatically adapted grasses and legumes are limited by the slope, the high content of lime, and the hazard of erosion.

Buse soils are typical of the soils in this group. The species that are most suitable in areas of these soils include alfalfa, crested wheatgrass, intermediate wheatgrass, pubescent wheatgrass, and smooth bromegrass. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group H.—The soils in this group are susceptible to erosion. Also, a limited available water capacity restricts the selection and productivity of climatically adapted grasses and legumes.

The soils in this group include Egeland, Embden, and Maddock soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, indiangrass, intermediate wheatgrass, smooth bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and controlling erosion. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor and help to control erosion. Applications of fertilizer may also be needed.

Group J.—The soils in this group are characterized by excessive salinity and alkalinity, which severely limit the selection and productivity of climatically adapted grasses and legumes.

Playmoor soils are typical of this group. The species that are most suitable in areas of these soils include tall wheatgrass and western wheatgrass. The major management concern is maintaining the desirable plant community. Proper grazing use, deferred grazing, and a planned grazing system help to maintain plant vigor and ensure the survival of the stand. These measures also help to maintain tilth and minimize surface compaction.

Group K.—The soils in this group receive additional moisture from runoff. They are suited to all of the climatically adapted grasses and legumes.

The soils in this group include Brookings, LaDelle, La Prairie, Moritz, Spottswood, Svea, and Waubay soils. The species that are most suitable in areas of these soils include alfalfa, big bluestem, creeping foxtail, indiangrass, intermediate wheatgrass, reed canarygrass, orchardgrass, smooth bromegrass, and switchgrass. The major management concerns are maintaining plant vigor and maintaining tilth. Proper grazing use, deferred grazing, a planned grazing system, and proper hayland management improve plant vigor, maintain tilth, and minimize compaction. Applications of fertilizer may also be needed.

Group NS.—The soils in this group are generally not suitable for pasture or hayland plantings because they are steep, are very shallow to gravel, are sandy and have a low content of organic matter, are very strongly saline or alkaline, are clayey and have a dense subsoil, are stony or very stony, or are subject to ponding. Examples are Langhei, Sioux, and Southam soils.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include a cropping sequence that results in the efficient use of the available moisture; erosion control and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and other essential elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The relative productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The

local office of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, or the South Dakota Agricultural Experiment Station can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for pasture and hayland, for rangeland, for woodland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA, 1961). These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 and IIIe-6.

The capability classification of the map units in this survey area is given in the sections “Detailed Soil Map Units” and “Interpretive Groups.”

Rangeland

David W. Schmidt, range conservationist, Natural Resources Conservation Service, helped prepare this section.

Rangeland supports native vegetation suitable for grazing or browsing. It includes areas where native vegetation has been reestablished. The vegetation is mainly grasses, grasslike plants, forbs, or shrubs. The amounts and kinds of native vegetation in any one area are determined by the soil, topography, climate, past use, and management.

All of the county was rangeland before the first permanent settlers arrived. Currently, about 9 percent of the county supports native vegetation (USDA, 1987). This rangeland supplies a portion of the forage for livestock in the county. Approximately 57 percent of the farm and ranch income in the county is derived from the sale of livestock and livestock products (U.S. Department of Commerce, 1987). Most of the livestock enterprises are cow-calf operations. Some are yearling operations, and some combine cow herds with yearlings. This latter practice permits

greater flexibility in adjusting livestock numbers during periods of drought. Sheep are raised in limited numbers throughout the county and are often run in combination with cow herds. The rangeland is generally grazed from May to October. The forage provided by rangeland is generally supplemented by crop aftermath and tame pasture plants, such as intermediate wheatgrass, orchardgrass, and smooth bromegrass. In winter the forage is supplemented by protein concentrate and hay.

Hamlin County is part of the tall grass prairie. The native vegetation is dominated by tall and mid grasses and forbs. Common tall grass species include big bluestem, switchgrass, and prairie dropseed. Mid grasses include little bluestem, sideoats grama, and needlegrasses. Goldenrod and prairie-clover are common forbs. The tall grass prairie consists of cool- and warm-season plants, which provide high-quality forage throughout the growing season. The cool-season plants grow mostly during April, May, and June and include such plants as porcupinegrass. The warm-season plants grow mostly during June, July, and August and include such plants as big bluestem. The cool-season grasses may start growing again in September and October if rainfall is adequate.

The native vegetation in many parts of the county is producing below its potential because of past management. The tall grasses and some of the mid grasses have been replaced by less desirable plants. In many areas of the county, the past misuse of the native vegetation has resulted in an invasion of cool-season tame grasses, such as smooth bromegrass and Kentucky bluegrass. As a result, the amount of available forage is reduced. In most areas, however, enough of the original plants remain for the reestablishment of high-quality native plants if good management practices are applied.

Range Sites and Condition Classes

Different kinds of soil vary in their capacity to produce native vegetation. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Soils that produce approximately the same kinds, amounts, and proportions of native vegetation make up a range site. The potential native vegetation on a range site is the stabilized plant community that the site is capable of producing. It consists of the plants that were growing on the site when the region was settled. This plant community maintains itself and changes very little as long as the environment remains unchanged. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil maps.

The plants within the native plant community are sometimes grouped as decreasers, increasers, and invaders, depending on their response to grazing pressure. Decreasers are plants that respond to overgrazing by decreasing in abundance. They generally are the most productive plants and the ones most preferred by the grazing animals. Increasers are plants that respond to grazing pressure, at least initially, by increasing in amount as the more desirable decreaser plants become less abundant. Increasers generally are less productive and less preferred by the grazing animals. Invaders are plants that are not part of the original plant community but invade because of some kind of disturbance or continued overgrazing. Some invader plants have little or no value for grazing.

Because plants do not respond in the same manner to different influences, a plant may be a decreaser on some range sites but an increaser on others. A cool-season plant, for example, may be a decreaser if the site is grazed only during the spring but would be an increaser if the same site were grazed only during the summer. The reverse would be true for the warm-season plants. Restricting grazing to the spring would cause the warm-season plants to increase in abundance, and restricting grazing to the summer would cause them to decrease.

Table 7 shows, for nearly all of the soils, the range site; the composition of species in the potential natural plant community; and the potential annual production of vegetation in favorable, average, and unfavorable years. *Potential annual production* is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaf, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperature make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as

exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management maintains the capacity of the rangeland to produce forage for livestock and game animals and to provide wildlife habitat, water, and watershed protection. The primary objective of good range management is to keep the rangeland in excellent or good condition. The main management concern is responding to important changes in the plant community of a range site.

Range condition is determined by comparing the present vegetation on a range site with the potential native plant community for the site. Four range condition classes are recognized. The range site is in *excellent* condition if 76 to 100 percent of the present vegetation is the same kind as the potential native vegetation. It is in *good* condition if the percentage is 51 to 75, in *fair* condition if the percentage is 26 to 50, and in *poor* condition if the percentage is 25 or less. The potential production depends on the range site, the range condition, and the moisture available to plants during the growing season.

Measures that maintain or improve the range condition are needed on all of the rangeland in the county. They include proper stocking rates and rotation or deferred rotation grazing systems. These systems provide rest periods that maintain or improve the vigor of the key plants. Good range management also includes range seeding, fencing, and measures that provide water for livestock.

The soils in the county are assigned to 12 different range sites. These range sites are described in the following paragraphs.

Limy Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Big bluestem and little bluestem, which are warm-season grasses, make up about 60 percent of the vegetation. Cool-season needlegrasses make up about 20 percent of the vegetation. Blue grama, bluegrasses, and sedges are in the understory. Forbs are common but are not dominant. This site is less productive than the Subirrigated site because of the seasonal high water table and the high content of lime in the soils.

The major management concern on this site is maintaining the extent of the most productive grasses. Big bluestem loses its productive capacity and thins out after continuous grazing because it is preferred by livestock. As the extent of big bluestem decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrasses, sedges, and downy brome become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Loamy Overflow range site. The potential native vegetation on this site is tall, warm-season prairie grasses. Big bluestem makes up about 60 percent of the vegetation. Warm-season, mid grasses, such as little bluestem and sideoats grama, make up about 10 percent. Sedges and bluegrasses are in the understory. Forbs, such as Maximilian sunflower, stiff sunflower, tall gayfeather, and goldenrod, and shrubs, such as leadplant and wild rose, occur on the site but are not dominant.

The major management concern on this site is maintaining the extent of the most productive grasses and forbs. Big bluestem, switchgrass, Maximilian sunflower, and stiff sunflower lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. As the extent of these plants decreases, the extent of little bluestem and sideoats grama initially increases. After continuous overgrazing, however, bluegrass, which is a short, cool-season grass, becomes the principal plant on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Saline Subirrigated range site. The potential native vegetation on this site is an excellent stand of warm-season, tall and mid grasses. Little bluestem makes up about 45 percent of the vegetation. Big bluestem makes up 20 percent; indiangrass, 10 percent; switchgrass, 10 percent; and sedges and forbs, 10 percent.

The major management concern on this site is maintaining the extent of the most productive plants. The plant community is very fragile. Big bluestem, little bluestem, indiangrass, and switchgrass rapidly lose their productive capacity and thin out after continuous grazing because livestock prefer these plants. As the extent of these plants decreases, inland saltgrass and foxtail barley become the principal plants on the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Sandy range site. The potential native vegetation

on this site is dominated by tall and mid, warm-season grasses. Big bluestem, sand bluestem, prairie sandreed, and switchgrass make up about 50 percent of the vegetation. Sideoats grama and little bluestem make up about 30 percent. Needleandthread and porcupinegrass, which are cool-season grasses, make up about 10 percent. Forbs, such as heath aster, scurfpea, and perennial sunflowers, make up about 5 percent. Shrubs, such as wild rose and leadplant, occur on the site but are not dominant.

The major management concern on this site is maintaining the extent of the most productive grasses. The extent of big bluestem, sand bluestem, and porcupinegrass decreases after continuous grazing because the livestock prefer these plants. The extent of prairie sandreed, needleandthread, little bluestem, and sideoats grama initially increases as that of the other grasses decreases. After continuous overgrazing, these grasses thin out and are replaced by blue grama and bluegrasses. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of these plants.

Shallow Marsh range site. This site is ponded in spring and early summer. The potential native vegetation is water-tolerant, tall prairie grasses and sedges. Rivergrass and sedges make up about 75 percent of the vegetation. American mannagrass, cordgrasses, and reedgrass make up about 15 percent. Forbs, such as smartweed and waterplantain, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive plants. If continued overgrazing is allowed, rivergrass and slough sedge are replaced by spikesedge and other grasslike plants, which are less palatable to livestock. An increase in the abundance of the less palatable vegetation results in a loss of available forage. The extent of the most productive plants can be maintained by using proper stocking rates and by using a deferred grazing program, which provides rest periods during the key growing season of these plants.

Shallow to Gravel range site. The potential native vegetation on this site is mid prairie grasses. Needleandthread, which is a cool-season grass, makes up about 45 percent of the vegetation. Warm-season grasses make up about 50 percent. They include little bluestem, plains muhly, and prairie dropseed, which make up 25 percent of the vegetation, and blue grama and hairy grama, which make up 10 percent. Sedges, forbs, and shrubs make up about 10 percent of the vegetation.

The major management concern on this site is maintaining the extent of the most productive grasses. Needleandthread, little bluestem, plains muhly, and prairie dropseed rapidly thin out if continuous overgrazing is allowed. When the extent of these grasses decreases, the extent of sedges and blue grama or hairy grama increases. If overgrazing continues, the productivity of the site is greatly reduced. The extent of the most productive grasses can be maintained by using proper stocking rates and by a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Silty range site. The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Cool-season grasses make up about 20 percent of the vegetation. They include green needlegrass and porcupinegrass. Warm-season grasses, such as little bluestem, big bluestem, and prairie dropseed, make up about 55 percent of the vegetation. Forbs, such as blacksamson, dotted gayfeather, stiff sunflower, heath aster, and prairie-clover, and shrubs, such as leadplant, rose, and western snowberry, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. If continuous grazing is allowed, the extent of big bluestem, prairie dropseed, porcupinegrass, and green needlegrass decreases because the livestock prefer these plants. Little bluestem and sideoats grama initially increase after continuous grazing. If continuous overgrazing is allowed, however, short grasses, such as blue grama, annual bromes, and bluegrasses, become the dominant plants. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Subirrigated range site. The potential native vegetation on this site is dominantly tall, warm-season grasses. Big bluestem is the dominant warm-season grass. It makes up about 50 percent of the vegetation. Prairie cordgrass, switchgrass, indiangrass, and little bluestem make up about 35 percent. Forbs, such as American licorice, Maximilian sunflower, downy gentian, Canada milkvetch, heath aster, and Missouri goldenrod, make up about 5 percent.

The major management concern on this site is maintaining the extent of the most productive tall

grasses. After continuous grazing, the extent of big bluestem, indiangrass, switchgrass, and forbs, such as Maximilian sunflower, decreases because the livestock prefer these plants. Little bluestem, sideoats grama, and sedges initially increase after continuous grazing. If continuous overgrazing is allowed, however, short grasses, such as bluegrasses, downy brome, and sedges, become the dominant plants. Low forage production is the result. The extent of the most productive tall grasses can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants.

Thin Upland range site. The potential native vegetation on this site is tall and mid grasses and a large number of forbs. Warm-season grasses make up 60 percent of the vegetation. These include little bluestem, which makes up 35 percent of the vegetation; prairie dropseed and big bluestem, which make up 20 percent; and sideoats grama, which makes up 5 percent. Cool-season grasses, such as green needlegrass, porcupinegrass, and needleandthread, make up about 20 percent of the vegetation. Forbs, such as pasqueflower, dotted gayfeather, and blacksamson, and woody plants, such as leadplant and rose, make up about 10 percent.

The major management concern on this site is maintaining the extent of the most productive grasses. Prairie dropseed, big bluestem, and porcupinegrass lose their productive capacity and thin out after continuous grazing because the livestock prefer these plants. The extent of little bluestem, sideoats grama, and needleandthread initially increases as the other grasses thin out. If continuous overgrazing is allowed, short grasses, such as blue grama, dominate the site. Low forage production is the result. The extent of the most productive grasses can be increased or maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Very Shallow range site. The potential native vegetation on this site is mid and short grasses. Needleandthread, plains muhly, and sideoats grama are the dominant mid grasses. They make up about 65 percent of the vegetation. Short grasses, such as blue grama and hairy grama, and sedges make up about 30 percent. Forbs, such as dotted gayfeather, blacksamson, and sagewort, make up about 5 percent. Shrubs, such as leadplant and wild rose, occur in smaller amounts.

The main management concern on this site is maintaining a good stand of grasses. If overgrazing is allowed, the site rapidly deteriorates to a stand of grama grasses, threadleaf sedge, and a few unpalatable forbs. If overgrazing continues, the stand of short grasses may thin out and much of the site is subject to erosion. A productive cover of grasses can be maintained by using proper stocking rates and by using a deferred grazing or rotation grazing program, which provides rest periods during the key growing season of the desirable plants.

Wetland range site. This range site has the potential to produce a luxuriant stand of grasses that tolerate a high water table. Because areas of this site are often under water during the spring, their use is limited to summer and fall. Prairie cordgrass is the dominant species. It makes up about 60 percent of the vegetation. Reedgrasses, reed canarygrass, switchgrass, Canada wildrye, bluegrasses, and sedges also grow on this site. They make up about 40 percent of the vegetation. Forbs, such as asters, waterhemlock, and giant goldenrod, and shrubs, such as indigo amorpha and willows, occur in small amounts.

The major management concern is maintaining the most productive plants. If continued overgrazing is allowed, the stand of climax grasses loses vigor and density and sedges, rushes, bluegrasses, and saltgrass increase or invade. A less productive plant community is the result. The most productive grasses can be maintained by using proper stocking rates and by using a rotation or deferred rotation grazing system, which provides periodic rest periods during the key growing seasons of these plants.

Wet Meadow range site. This range site has the potential to produce a luxuriant stand of sedges and mid or tall grasses. Sedges are the dominant species. They make up about 40 percent of the vegetation. Tall grass species, such as reedgrasses, prairie cordgrass, and reed canarygrass, make up about 40 percent of the vegetation. Mid grasses, such as western wheatgrass and bluegrasses, occur on the site but are not dominant. Forbs, such as smartweed, aster, and milkweed, are common but generally make up only about 5 percent of the vegetation. A few willows also grow on this site.

The major management concern on this site is maintaining the most productive grasses and sedges. Some areas are not usable by livestock during the spring and early summer because they are commonly ponded for about 4 to 8 weeks after periods of snowmelt or heavy rainfall. Surface compaction can be a problem if grazing is allowed during wet periods. If continued overgrazing is allowed,

the extent of the tall grasses and the more palatable sedges decreases, the extent of the less palatable spikesedge and rushes increases, and weedy grasses, such as foxtail barley, invade. Low forage production is the result. The most productive grasses and sedges can be maintained by using proper stocking rates and by using a rotation grazing or deferred grazing program, which provides rest periods during the key growing season of these plants. Deferring grazing during wet periods helps to prevent surface compaction.

Native Woodland, Windbreaks, and Environmental Plantings

Thomas A. Hurford, resource conservationist, Natural Resources Conservation Service, helped prepare this section.

Native trees and shrubs in Hamlin County are limited to the wet fringes adjacent to drainageways, potholes, and lakes. These areas consist mainly of Badger, Cubden, Fairdale, LaDelle, Lamoure, La Prairie, Lowe, Marysland, Mauvais, Minnewaukan, and Moritz soils. Peachleaf willow, sandbar willow, and eastern cottonwood are the predominant species. In addition, scattered clumps of American plum, western snowberry, and common chokecherry grow throughout the county on a variety of soils.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. They protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife. They may consist of one or more rows of adapted trees and shrubs.

Farmstead and feedlot windbreaks are planted to protect buildings and livestock from the severe winter weather that is common in Hamlin County. In addition, these plantings provide winter cover for wildlife. They also help to beautify and screen houses and other buildings and to abate noise. Farmstead and feedlot windbreaks generally consist of multiple rows of adapted trees and shrubs. Many of the older plantings in the county have been neglected and are in need of renovation. Renovation may include planting additional trees adjacent to the existing windbreaks and controlling grasses within the older windbreaks. Competition from grass species, such as smooth bromegrass, is a major factor contributing to the decline of windbreaks in Hamlin County. Plant competition can be controlled with herbicides or tillage.

To ensure plant survival, locally adapted planting stock should be used and planted in a properly prepared site. If possible, the site should be one on which summer fallowing was practiced during the year prior to planting. Table 8 shows suitable trees and shrubs for planting as well as the expected 20-year height of the species on the various soils in the county.

At the end of each map unit description under the heading “Detailed Soil Map Units” and in the section “Interpretive Groups,” the soils are assigned to windbreak suitability groups. A windbreak suitability group is a distinctive group of soils that supports trees and shrubs having similar growth and survival rates if weather conditions are normal and the windbreak is properly managed. The relationship between the soils and the growth of trees and shrubs was ascertained during this survey. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the growth of trees and shrubs. Soil reaction, salt content, and a seasonal high water table also are important. The windbreak suitability groups in this survey area are described in the following paragraphs.

Group 1. The soils in this group are well suited to woody plantings. They are on footslopes and high flood plains. They receive additional moisture from runoff and flooding. Some areas are subirrigated. All climatically suited trees and shrubs grow well.

This group consists mainly of loamy, silty, and clayey, somewhat poorly drained to well drained soils that are deep and very deep. Available water capacity is moderate or high. The fine sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils in this group are Brookings, Cubden, Divide, Embden, LaDelle, La Prairie, McIntosh, Moritz, Svea, and Waubay soils.

Group 2. The soils in this group are well suited to woody plantings. They are on toeslopes and low flood plains. They receive additional moisture from runoff or have a high water table within the root zone. All climatically suited trees and shrubs grow well.

This group consists of deep and very deep, silty, loamy, and clayey, poorly drained and somewhat poorly drained soils. Available water capacity is high. The sandy loams and loamy fine sands are subject to severe wind erosion. Typical soils are Badger, Lamoure, and Minnewaukan soils.

Group 3. The soils in this group are well suited to woody plantings. They are on summits, backslopes, and footslopes. Except for those that require abundant moisture, all climatically suited trees and shrubs grow well.

This group consists of deep and very deep, loamy and silty, well drained soils. Available water capacity is moderate or high. The susceptibility to water erosion ranges from slight in the nearly level soils to severe in the strongly sloping areas. The susceptibility to wind

erosion ranges from slight to severe. Typical soils are Barnes, Brandt, Kranzburg, Poinsett, Strayhoss, and Vienna soils.

Group 4. The soils in this group are fairly well suited to woody plantings. They are on summits, shoulder slopes, backslopes, and footslopes. Most of the climatically suited trees and shrubs grow well; however, maximum growth is not possible because of the limited root development.

This group consists of moderately deep, deep, and very deep, clayey soils and clayey soils that have a surface layer of loamy or silty material. The soils are moderately well drained and well drained. Available water capacity is low or moderate in the more clayey soils and moderate or high in the silty and loamy soils. Soils having accumulations of salts in the lower part of the subsoil also are in this group. The clayey soils are subject to severe wind erosion. The moderately sloping and strongly sloping soils are subject to severe water erosion. Typical soils in this group are Hetland soils.

Group 5. The soils in this group are well suited to woody plantings. They are on summits, shoulder slopes, and backslopes. All climatically suited trees and shrubs grow well, except those that require abundant moisture.

This group consists mainly of deep and very deep, loamy and sandy, well drained and somewhat excessively drained soils. Available water capacity generally is low or moderate. The soils are subject to severe or very severe wind erosion. Typical soils are Egeland and Maddock soils.

Group 6. The soils in this group are poorly suited to woody plantings. They are on summits, backslopes, and footslopes. No trees and shrubs grow well on the soils in this group. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of silty and loamy, well drained and somewhat excessively drained soils that are moderately deep to bedrock or are shallow or moderately deep to sand and gravel. Available water capacity is low or moderate. The moderately sloping and strongly sloping soils are subject to severe erosion. Typical soils are Fordville and Renshaw soils.

Group 7. The soils in this group are poorly suited to woody plantings. No trees or shrubs grow well. Coniferous trees and shrubs are better suited than deciduous trees and shrubs. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, sandy, somewhat excessively drained and excessively drained soils. Available water capacity is very low or low. The soils are subject to very severe wind erosion. None of the soils in Hamlin County are assigned to this group.

Group 8. The soils in this group are poorly suited to woody plantings. They are on shoulder slopes and footslopes. No trees and shrubs grow well. Plantings can be established, but optimum survival and growth should not be expected. Field windbreaks are not effective because of the slow growth rate and the low height at maturity.

This group consists of moderately deep, deep, and very deep, loamy and silty, well drained soils that contain enough calcium carbonate at or near the surface to adversely affect the growth and survival of trees and shrubs. Available water capacity is moderate or high. The soils are subject to severe wind erosion and water erosion. Buse soils are typical of the soils in this group.

Group 9. The soils in this group are poorly suited to woody plantings. They have a dense claypan subsoil and an excessive amount of salt in the lower part of the subsoil. No trees and shrubs grow well because of the adverse effects of the dense claypan subsoil and the salts.

This group consists of deep and very deep, silty and loamy, moderately well drained soils. Available water capacity is low or moderate. None of the soils in Hamlin County are assigned to this group.

Group 10. The soils in this group generally are unsuited to woody plantings. They are very shallow to gravel, very saline, very alkaline, stony, or very wet. Specialized plantings for wildlife, recreation, or beautification may be established in some areas. The most favorable sites should be selected, and only those trees and shrubs that have the best potential to survive and grow should be planted.

The soils in this group have a wide range of texture, depth, drainage, available water capacity, permeability, and slope characteristics. Susceptibility to water erosion and wind erosion ranges from slight to very severe. Typical soils are Buse, Colvin, Langhei, Mauvais, Oldham, Parnell, Playmoor, Rauville, Sioux, Southam, and Tonka soils.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service, the South Dakota Cooperative Extension Service, and the South

Dakota Agricultural Experiment Station or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Connie M. Vicuna, biologist, Natural Resources Conservation Service, helped prepare this section.

Hamlin County provides a variety of wildlife habitat types, including rangeland, cropland, and wetlands. Wildlife species include white-tailed deer, gray partridge, dove, cottontail rabbits, squirrels, pheasants, ducks, geese, and other waterbirds. Important furbearers include beaver, mink, muskrats, fox, coyotes, raccoons, and skunks. Prairie chickens and sharptail grouse may also inhabit the survey area.

Walleye, northern pike, and bullheads are the primary fish species in the county. There are numerous lakes and streams that provide many opportunities for recreational fishing.

Prairie pothole wetlands are abundant in Hamlin County. There are wetlands on the flood plains along the Big Sioux River and other streams. Wetlands range in size from less than 0.1 acre to more than 1,000 acres. Water regimes are equally variable and include temporary to permanent waters. The great diversity and number of wetlands make this area extremely attractive to waterfowl that are residents from spring through fall. Important wetland soils include Lamoure, Marysland, Oldham, Parnell, Playmoor, Rauville, Southam, and Tonka soils.

Rangeland habitat occurs in the steep, rolling hills of the Coteau des Prairies. These grasslands, in conjunction with the numerous intermixed wetlands, provide important habitat for waterfowl production. Rangeland also provides habitat for sharptail grouse, prairie chickens, and deer and other mammals.

Woody habitat in the county is limited. It occurs along the Big Sioux River and other streams and around the margins of many lakes and wetlands. Although they are not abundant, these shrubby and wooded areas are very important for many wildlife species. They provide either food or cover during some part of the year.

Soils affect the kind and amount of vegetation that is available for wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing specific elements of wildlife habitat. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining the habitat elements; and in determining the intensity of management needed for each habitat element.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element. The element can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element are very severe and that unsatisfactory results can be expected. Establishing, improving, or maintaining the element is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. They are primarily food sources for wildlife, but small grain crops also provide some nesting cover. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, sorghum, wheat, oats, barley, rye, soybeans, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. They provide nesting and roosting cover. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are intermediate wheatgrass, bromegrass, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. They provide food, nesting cover, and escape cover. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of native herbaceous plants are big bluestem, switchgrass, indiangrass, green needlegrass, and sideoats grama.

Planted woody plants include trees and shrubs that require cultivation before and during establishment. These plants provide fruit, buds, twigs, bark, and foliage and are important as food sources, nesting cover, winter cover, and escape cover. Soil properties and features that affect the growth of trees and shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of planted woody plants are green ash, hackberry, caragana, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native deciduous trees and woody understory produce nuts or other fruit, buds, twigs, bark, and foliage. They provide food for wildlife and are important as winter cover and escape cover. Soil properties and features that affect the growth of these trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are elm, cottonwood, ash, bur oak, willow, plum, and chokecherry.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Eastern redcedar is the primary example of these plants in the survey area.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are gooseberry, snowberry, and sumac.

Wetland plants are annual and perennial wild

herbaceous plants that grow on moist or wet sites. They provide food and nesting cover. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattails, sloughgrass, whitetop, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

Additional information concerning maintaining and managing specific wildlife species is available at the local office of the Natural Resources Conservation Service; the South Dakota Department of Game, Fish, and Parks; or the United States Fish and Wildlife Service.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soil or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and shrinking and swelling can cause the movement of footings. A high water table, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Large stones interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel are less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of about 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of

suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Reaction and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, salinity, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage and piping and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by the cropping system, depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, and large stones affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, and slope affect the construction of grassed waterways. Low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the establishment, growth, and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

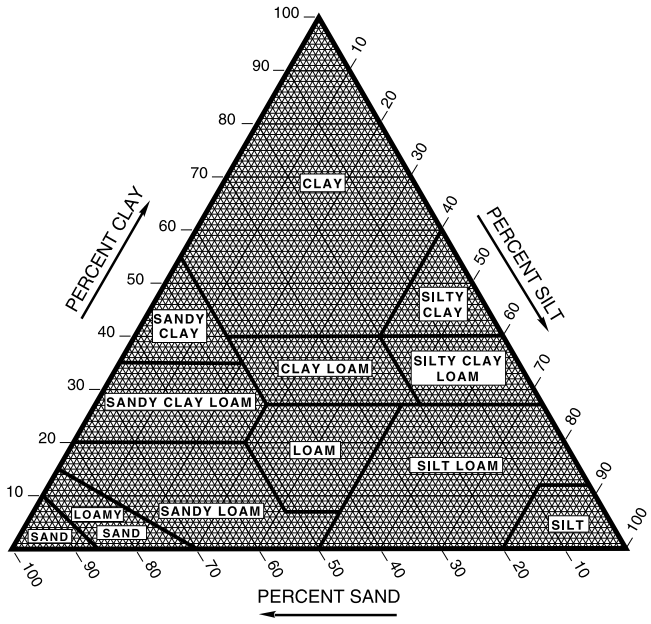

Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting

engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design and management of irrigation systems, development of nutrient and pesticide management plans, design of soil drainage systems, and design of septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to

be grown, in the selection of a tillage system, in the management of crop residue, and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in selecting pesticides, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated based on the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K in the county range from 0.17 to 0.37. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of potential soil loss. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.
7. Silts, noncalcareous silty clay loams that are

less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by limiting residue removal operations, by including high-residue crops in the rotation a high percentage of the time, and by applying agricultural waste to the soil. Agricultural waste should only be applied in an environmentally acceptable manner. Organic matter affects available water capacity, infiltration rate, pesticide efficiency and persistence, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of very deep and deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep, deep, or very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are depth to the seasonal high water table; the kind of water table—

that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (*Bor*, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploborolls (*Hapl*, meaning minimal horizonation, plus *boroll*, the suborder of the Mollisols that has a cool temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Udic Haploborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed Udic Haploborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (USDA, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1975). Unless otherwise stated, matrix colors in the descriptions are for dry soil. No wet consistence is given for nonsticky and nonplastic. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section “Detailed Soil Map Units.”

Arvilla Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid in the loamy

sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Arvilla sandy loam, 0 to 2 percent slopes, 920 feet south and 245 feet west of the northeast corner of sec. 2, T. 114 N., R. 52 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.
A—6 to 12 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable; common fine roots; neutral; clear wavy boundary.
Bw—12 to 22 inches; brown (10YR 5/3) sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to moderate medium granular; soft, very friable; few very fine roots; neutral; clear wavy boundary.
Bk—22 to 25 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grain; loose; about 12 percent gravel; slight effervescence; slightly alkaline; gradual wavy boundary.
2C—25 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose; about 30 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 14 to 25 inches
Depth to contrasting or impervious layer: 14 to 25 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a 2Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam, coarse sandy loam, loam, or fine sandy loam

Bw horizon:
Hue—7.5YR, 10YR, or 2.5Y
Value—3 to 5 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam, coarse sandy loam, loam, fine sandy loam, or loamy sand

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—loamy sand, sand, sandy loam, or coarse sandy loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—gravelly coarse sand, sand, coarse sand, loamy sand, or loamy coarse sand

Badger Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Badger silty clay loam, 1,275 feet west and 275 feet south of the northeast corner of sec. 34, T. 114 N., R. 55 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; hard, friable, sticky and plastic; few fine roots; neutral; abrupt smooth boundary.
Bt—8 to 36 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; shiny films on faces of peds; few fine roots; neutral; clear wavy boundary.
BCg—36 to 47 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; many fine prominent yellowish brown (10YR 5/6) and few fine distinct very dark gray (10YR 3/1) mottles; weak coarse prismatic structure; hard, firm, slightly sticky and plastic; few medium accumulations of gypsum; slightly alkaline; clear wavy boundary.
Cg—47 to 60 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; many medium prominent strong brown (7.5YR 5/6) mottles; massive; hard, firm, sticky and plastic; common medium accumulations of gypsum; few

fine manganese accumulations; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 36 inches
Depth to carbonates: 35 to more than 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: 45 to more than 60 inches
Other features: Some pedons have a 2C horizon.

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, clay loam, or loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 or 2
Texture—clay, silty clay, silty clay loam, or clay loam

BCg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay, clay loam, silty clay loam, silt loam, or loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam, clay loam, sandy clay loam, loam, or silt loam

Barnes Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 0 to 25 percent

Typical Pedon

Barnes loam (fig. 10), in an area of Barnes-Buse loams, 2 to 6 percent slopes, 375 feet east and 120 feet south of the northwest corner of sec. 4, T. 113 N., R. 52 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; about 3 percent pebbles; neutral; abrupt wavy boundary.

Bw1—8 to 15 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; about 3 percent pebbles; neutral; clear wavy boundary.

Bw2—15 to 22 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to weak fine and medium subangular blocky; hard, friable, sticky and slightly plastic; few fine roots; about 3 percent pebbles; neutral; clear wavy boundary.

Bk—22 to 36 inches; light yellowish brown (2.5Y 6/3) clay loam, olive brown (2.5Y 4/4) moist; moderate fine prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine prominent strong brown (7.5YR 5/8) iron stains; common medium and fine accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.

C—36 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, slightly sticky and plastic; few fine distinct brownish yellow (10YR 6/8) iron stains; about 5 percent pebbles; violent effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 10 to 20 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, clay loam, fine sandy loam, sandy loam, sandy clay loam, or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—loam, clay loam, or sandy clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Brandt Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loess or silty alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Brandt silty clay loam (fig. 11), 0 to 2 percent slopes, 2,630 feet west and 155 feet south of the northeast corner of sec. 1, T. 115 N., R. 53 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; abrupt smooth boundary.
Bw1—8 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear wavy boundary.
Bw2—13 to 19 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; clear wavy boundary.
Bw3—19 to 32 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; abrupt wavy boundary.
Bk1—32 to 42 inches; light yellowish brown (2.5Y 6/3) silt loam, olive brown (2.5Y 4/3) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.
2Bk2—42 to 49 inches; light yellowish brown (2.5Y 6/3) gravelly loam, light olive brown (2.5Y 5/3) moist; single grain; loose; about 20 percent gravel; strong effervescence; slightly alkaline; clear wavy boundary.
2C—49 to 60 inches; pale yellow (2.5Y 7/3) gravelly loamy sand, light olive brown (2.5Y 5/3) moist; single grain; loose; about 20 percent gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 20 to 48 inches
Depth to contrasting or impervious layer: 40 to 60 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a C horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam, loam, or silty clay loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—gravelly loam, gravelly sandy loam, or gravelly clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, sand, gravelly loam, gravelly sandy loam, gravelly loamy sand, gravelly sand, very gravelly loamy sand, or very gravelly sand

Brookings Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess or silty glacial till over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

Brookings silty clay loam (fig. 12), in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 2,385 feet north and 195 feet east of the southwest corner of sec. 14, T. 114 N., R. 51 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; slightly acid; abrupt smooth boundary.
A—8 to 17 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure parting to weak fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; slightly acid; clear wavy boundary.
Bw—17 to 25 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; neutral; clear wavy boundary.
Bk1—25 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; violent effervescence; slightly alkaline; abrupt wavy boundary.
2Bk2—32 to 48 inches; light gray (2.5Y 7/2) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; about 3 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.
2C—48 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine distinct brownish yellow (10YR 6/6) mottles; massive; hard, friable, slightly sticky and plastic; about 3 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting or impervious layer: 20 to 40 inches over loamy glacial till
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons do not have a 2Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

2Bk horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—clay loam or loam

Buse Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loamy glacial till
Slope: 3 to 40 percent

Typical Pedon

Buse loam (fig. 13), in an area of Buse-Barnes loams, 9 to 20 percent slopes, 135 feet south and 1,000 feet west of the northeast corner of sec. 23, T. 113 N., R. 52 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine

roots; about 5 percent pebbles; strong effervescence; slightly alkaline; abrupt smooth boundary.
Bk—7 to 24 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few fine and medium accumulations of carbonate; about 7 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.
C—24 to 60 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine prominent strong brown (7.5YR 5/8) iron stains; few fine accumulations of carbonate; about 10 percent pebbles; violent effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 10 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 8 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—loam or clay loam

Castlewood Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Flood plains
Parent material: Clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Castlewood silty clay, 2,020 feet east and 205 feet north of the southwest corner of sec. 29, T. 114 N., R. 51 W.

A1—0 to 10 inches; very dark gray (5Y 3/1) silty clay, black (5Y 2/1) moist; weak fine and medium subangular blocky structure parting to moderate fine granular; hard, friable, sticky and plastic; many fine roots; neutral; gradual wavy boundary.
A2—10 to 18 inches; very dark gray (5Y 3/1) silty clay, black (5Y 2/1) moist; weak medium and coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, sticky and plastic; many fine roots; neutral; abrupt wavy boundary.
Bg1—18 to 28 inches; dark gray (5Y 4/1) clay, very dark gray (5Y 3/1) moist; weak coarse subangular blocky structure parting to moderate fine granular; hard, friable, sticky and plastic; common very fine roots; slightly alkaline; clear wavy boundary.
Bg2—28 to 39 inches; olive gray (5Y 4/2) clay, dark olive gray (5Y 3/2) moist; weak coarse subangular blocky structure parting to moderate fine granular; very hard, friable, sticky and plastic; few very fine roots; slightly alkaline; gradual wavy boundary.
Bg3—39 to 46 inches; dark gray (5Y 4/1) clay, very dark gray (5Y 3/1) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; slightly alkaline; clear wavy boundary.
Cg1—46 to 50 inches; gray (5Y 6/1) sandy loam, dark gray (5Y 4/1) moist; massive; very hard, friable, sticky; slightly alkaline; abrupt wavy boundary.
Cg2—50 to 58 inches; light gray (5Y 7/1), stratified clay loam, loam, and sandy loam, gray (5Y 5/1) moist; massive; very hard, friable, slightly sticky and plastic; slightly alkaline; abrupt wavy boundary.
2Cg3—58 to 60 inches; light olive gray (5Y 6/2) gravelly loamy coarse sand, olive gray (5Y 4/2) moist; single grain; loose; about 20 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 15 to more than 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay, clay, clay loam, or silty clay loam

Bg horizon:
Hue—2.5Y, 5Y, or neutral
Value—3 to 6 (2 to 5 moist)
Chroma—0 to 2
Texture—clay, silty clay, silty clay loam, or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 3
Texture—stratified clay loam, loam, and sandy loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 3
Texture—gravelly loamy coarse sand

Colvin Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Silty glaciolacustrine sediments
Slope: 0 to 1 percent

Typical Pedon

Colvin silty clay loam, in an area of Colvin-Oldham silty clay loams, 150 feet north and 850 feet west of the southeast corner of sec. 6, T. 114 N., R. 53 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; slightly alkaline; abrupt wavy boundary.
Bk—7 to 17 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine prominent yellow (2.5Y 7/6) mottles; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; disseminated carbonate throughout; violent effervescence; moderately alkaline; clear wavy boundary.
Bky—17 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; disseminated carbonate throughout; many fine nests of gypsum; violent effervescence; moderately alkaline; clear wavy boundary.
Cg1—35 to 49 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; many fine prominent yellowish brown (10YR 5/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine nests of gypsum; strong effervescence; slightly alkaline; gradual wavy boundary.
Cg2—49 to 60 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; common coarse prominent strong brown (7.5YR 5/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over finer or coarser material
Depth to gypsum and other salts: 15 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—5 to 8 (3 to 7 moist)
Chroma—0 to 3
Texture—silt loam, silty clay loam, or clay loam

Cg horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (3 to 6 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, or clay loam

Cubden Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Till plains

Parent material: Silty glacial till or loess
Slope: 0 to 2 percent

Typical Pedon

Cubden silty clay loam, in an area of Cubden-Tonka silty clay loams, 150 feet south and 50 feet west of the northeast corner of sec. 15, T. 114 N., R. 55 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

ABk—9 to 14 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common fine accumulations of carbonate; violent effervescence; moderately alkaline; abrupt wavy boundary.

Bk1—14 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; disseminated carbonate throughout; violent effervescence; moderately alkaline; clear wavy boundary.

Bk2—18 to 40 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; disseminated carbonate throughout; violent effervescence; moderately alkaline; clear wavy boundary.

C1—40 to 45 inches; light yellowish brown (2.5Y 6/3) silty clay loam, olive brown (2.5Y 4/3) moist; few medium prominent yellowish brown (10YR 5/8) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; violent effervescence; slightly alkaline; clear wavy boundary.

C2—45 to 55 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; many coarse prominent strong brown (7.5YR 5/8) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; violent effervescence; slightly alkaline; clear wavy boundary.

C3—55 to 60 inches; light gray (5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; few fine prominent strong brown (7.5YR 5/8) and common medium prominent brownish yellow (10YR 6/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; violent effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: 40 to more than 60 inches
Other features: Some pedons have a 2C horizon.

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

ABk horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silty clay loam or silt loam

2C horizon (if it occurs):
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Divide Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Divide loam, 2,080 feet north and 450 feet east of the southwest corner of sec. 19, T. 113 N., R. 52 W.

Ap—0 to 4 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular;

soft, very friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.
A—4 to 9 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many fine roots; about 2 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.
Bk1—9 to 17 inches; light brownish gray (2.5Y 6/2) loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; many fine roots; few fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.
Bk2—17 to 30 inches; light yellowish brown (2.5Y 6/3) loam, light olive brown (2.5Y 5/4) moist; many fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine and medium accumulations of carbonate; violent effervescence; slightly alkaline; clear wavy boundary.
2C—30 to 60 inches; yellowish brown (10YR 5/4) gravelly sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; about 25 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 20 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, sandy loam, sandy clay loam, silt loam, or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (3 to 7 moist)
Chroma—1 to 4
Texture—loam, clay loam, or sandy clay loam

2C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 6
Texture—stratified sand to gravelly sand

Egeland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Outwash plains and moraines
Parent material: Loamy glaciofluvial sediments
Slope: 2 to 9 percent

Typical Pedon

Egeland sandy loam, in an area of Egeland-Embden complex, 2 to 6 percent slopes, 2,490 feet east and 140 feet north of the southwest corner of sec. 28, T. 114 N., R. 51 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; common fine roots; neutral; abrupt smooth boundary.
A—7 to 10 inches; gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; common fine roots; neutral; clear wavy boundary.
Bw1—10 to 19 inches; light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to weak fine granular; soft, very friable; common fine roots; neutral; clear wavy boundary.
Bw2—19 to 25 inches; light olive brown (2.5Y 5/3) sandy loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak fine granular; soft, very friable; common fine roots; neutral; clear wavy boundary.
Bk1—25 to 37 inches; light yellowish brown (2.5Y 6/3) loamy sand, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure; soft, very friable; few fine roots; few fine accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.
Bk2—37 to 52 inches; light yellowish brown (2.5Y 6/3) sandy loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; soft, very friable; few medium accumulations of carbonate; strong effervescence; slightly alkaline; gradual wavy boundary.
C—52 to 60 inches; light yellowish brown (2.5Y 6/3) fine sandy loam, olive brown (2.5Y 4/3) moist; massive; soft, very friable; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 45 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—sandy loam, fine sandy loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 5 moist)
Chroma—1 to 4
Texture—sandy loam, fine sandy loam, loamy sand, or loamy fine sand

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, fine sandy loam, or loamy very fine sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, sandy loam, loamy very fine sand, very fine sandy loam, or fine sandy loam

Embden Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately rapid
Landform: Outwash plains
Parent material: Loamy glaciofluvial sediments
Slope: 2 to 6 percent

Typical Pedon

Embden fine sandy loam, in an area of Egeland-Embden complex, 2 to 6 percent slopes, 290 feet east and 450 feet south of the northwest corner of sec. 20, T. 114 N., R. 51 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; few very fine roots; neutral; abrupt smooth boundary.
A—8 to 13 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable; few very fine roots; neutral; clear smooth boundary.
Bw1—13 to 38 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; slightly hard, very friable; neutral; clear wavy boundary.
Bw2—38 to 45 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; clear wavy boundary.
C—45 to 60 inches; light olive brown (2.5Y 5/4) fine sandy loam, olive brown (2.5Y 4/4) moist; massive; soft, very friable; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 40 inches
Depth to carbonates: 20 to 60 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over finer or coarser material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—fine sandy loam, sandy loam, very fine sandy loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—fine sandy loam, loam, sandy loam, or very fine sandy loam

Bk horizon (if it occurs):
Hue—10YR, 2.5Y, or 5Y
Value—4 to 8 (3 to 6 moist)
Chroma—1 to 4
Texture—fine sandy loam, sandy loam, loamy fine sand, very fine sandy loam, or loamy sand

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4

Texture—fine sandy loam, sandy loam, loamy fine sand, or very fine sandy loam

Estelline Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the silty sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loess or silty alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Estelline silt loam (fig. 14), 0 to 2 percent slopes, 1,230 feet west and 110 feet north of the southeast corner of sec. 17, T. 113 N., R. 52 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; common fine roots; neutral; abrupt wavy boundary.
Bw1—9 to 22 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; common fine roots; neutral; gradual wavy boundary.
Bw2—22 to 33 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear wavy boundary.
Bk—33 to 36 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; few fine roots; common medium accumulations of carbonate; violent effervescence; slightly alkaline; abrupt wavy boundary.
2C1—36 to 40 inches; light yellowish brown (2.5Y 6/3) gravelly sandy loam, olive brown (2.5Y 4/3) moist; single grain; loose; about 18 percent gravel; strong effervescence; slightly alkaline; clear wavy boundary.
2C2—40 to 49 inches; yellowish brown (10YR 5/4) gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; about 30 percent gravel; slight effervescence; slightly alkaline; clear wavy boundary.
2C3—49 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 4/3) moist; single grain; loose; about 10 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 25 inches
Depth to carbonates: 22 to 40 inches
Depth to contrasting or impervious layer: 22 to 40 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silt loam or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam or silty clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—loamy sand, sand, gravelly loamy sand, very gravelly loamy sand, gravelly sandy loam, or gravelly sand

Fairdale Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Fairdale loam, channeled, 2,650 feet west and 230 feet south of the northeast corner of sec. 15, T. 115 N., R. 52 W.

A—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; slight effervescence; slightly alkaline; abrupt wavy boundary.

C1—8 to 21 inches; gray (10YR 5/1) loam stratified with thin lenses of fine sandy loam, very dark gray (10YR 3/1) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; slightly alkaline; abrupt wavy boundary.
C2—21 to 30 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; few fine faint light olive brown (2.5Y 5/4) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
C3—30 to 41 inches; gray (10YR 5/1), stratified loam, sandy loam, and loamy coarse sand, very dark gray (10YR 3/1) moist; few fine faint light yellowish brown (10YR 6/4) mottles; massive; slightly hard, very friable; common fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
C4—41 to 52 inches; gray (10YR 5/1) loam stratified with thin lenses of sandy loam, very dark gray (10YR 3/1) moist; common fine faint dark brown (10YR 3/3) mottles; massive; slightly hard, very friable; few fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
C5—52 to 60 inches; gray (10YR 5/1), stratified loamy coarse sand, loam, and sandy loam, very dark gray (10YR 3/1) moist; weak coarse distinct yellowish brown (10YR 5/4) mottles; massive; soft, very friable; strong effervescence; slightly alkaline.

Range in Characteristics

Carbonates: At the surface
Depth to contrasting or impervious layer: 40 to more than 60 inches over sandy material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, clay loam, fine sandy loam, very fine sandy loam, silty clay loam, or silty clay

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—stratified loam, silt loam, fine sandy loam, very fine sandy loam, sandy loam, loamy coarse sand, clay loam, or silty clay loam

Fordville Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 6 percent

Typical Pedon

Fordville loam, 0 to 2 percent slopes, 1,925 feet south and 110 feet east of the northwest corner of sec. 20, T. 113 N., R. 52 W.

Ap—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; slightly acid; abrupt smooth boundary.
A—4 to 11 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt wavy boundary.
Bw1—11 to 17 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak fine granular; soft, very friable; slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.
Bw2—17 to 24 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak fine subangular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine roots; neutral; clear wavy boundary.
Bw3—24 to 30 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky; few very fine roots; about 5 percent gravel; neutral; abrupt wavy boundary.
2C—30 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; about 40 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 30 inches
Depth to carbonates: 17 to 40 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material

Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, stony loam, or very stony loam

Bw horizon:
Hue—10YR
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam, silt loam, or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—sand, gravelly loamy sand, gravelly sand, very gravelly sand, loamy sand, gravelly coarse sand, or very gravelly loamy sand

Hetland Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Slow
Landform: Ice-walled lake plains
Parent material: Clayey glaciolacustrine sediments
Slope: 0 to 6 percent

Typical Pedon

Hetland silty clay loam, 0 to 2 percent slopes, 2,590 feet west and 2,530 feet south of the northeast corner of sec. 34, T. 114 N., R. 55 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable, sticky and plastic; common very fine roots; neutral; abrupt smooth boundary.
A—7 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots; neutral; abrupt wavy boundary.
Bt—10 to 21 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, sticky and plastic; common very fine roots; continuous shiny films on faces of peds; neutral; clear wavy boundary.
Bk1—21 to 29 inches; light yellowish brown (2.5Y 6/3) silty clay loam, olive brown (2.5Y 4/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable, sticky and plastic; common very fine roots; few fine accumulations of carbonate; strong effervescence; moderately alkaline; clear wavy boundary.
Bk2—29 to 39 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; few fine distinct strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; common medium accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.
C—39 to 60 inches; light yellowish brown (2.5Y 6/4), varved silty clay loam, light olive brown (2.5Y 5/4) moist; few fine prominent yellowish red (5YR 4/6) mottles; massive; slightly hard, friable, sticky and plastic; few fine accumulations of carbonate; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 26 inches
Depth to carbonates: 16 to 32 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silty clay

Bt horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—silty clay or silty clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silty clay loam or silt loam

Kranzburg Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loess or silty glacial till over loamy glacial till
Slope: 0 to 6 percent

Typical Pedon

Kranzburg silty clay loam (fig. 15), in an area of Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes, 1,130 feet west and 500 feet north of the southeast corner of sec. 31, T. 113 N., R. 51 W.

A—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.

Bw1—8 to 14 inches; dark brown (10YR 4/3) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; gradual wavy boundary.

Bw2—14 to 26 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; abrupt wavy boundary.

2Bk—26 to 44 inches; light yellowish brown (2.5Y 6/3) clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and slightly plastic; few fine roots; common medium accumulations of carbonate; about 3 percent pebbles; violent effervescence; moderately alkaline; clear wavy boundary.

2C—44 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, slightly sticky and plastic; common fine distinct yellowish brown (10YR 5/6) iron stains; few fine accumulations of carbonate; about 3 percent pebbles; violent effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 19 to 32 inches
Depth to contrasting or impervious layer: 20 to 40 inches over loamy glacial till
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a Bk horizon, which is silty clay loam or silt loam.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—2 or 3
Texture—silty clay loam or silt loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—clay loam or loam

LaDelle Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 2 percent

Typical Pedon

LaDelle silt loam, 2,195 feet east and 165 feet south of the northwest corner of sec. 19, T. 114 N., R. 51 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt smooth boundary.

A—5 to 20 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, friable, slightly sticky and slightly plastic; common fine roots; slight effervescence; slightly alkaline; clear wavy boundary.

Bk—20 to 32 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly

plastic; common fine roots; violent effervescence; moderately alkaline; clear wavy boundary.
C1—32 to 43 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.
C2—43 to 60 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 17 to 50 inches
Depth to carbonates: 0 to more than 60 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: 20 to more than 60 inches

A horizon:
Hue—10YR or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silt loam, silty clay loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—3 to 6 (2 to 5 moist)
Chroma—1 to 3
Texture—silt loam, silty clay loam, or loam

C horizon:
Hue—10YR or 2.5Y
Value—3 to 7 (2 to 5 moist)
Chroma—1 to 4
Texture—stratified silt loam to clay loam

Lamoure Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained and poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Lamoure silty clay loam, 160 feet north and 970 feet west of the southeast corner of sec. 10, T. 115 N., R. 52 W.

A1—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable, slightly sticky and slightly plastic; many fine roots; slight effervescence; moderately alkaline; clear smooth boundary.
A2—7 to 18 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; moderately alkaline; clear wavy boundary.
A3—18 to 25 inches; dark gray (5Y 4/1) silty clay loam, very dark gray (5Y 3/1) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.
A4—25 to 35 inches; dark gray (5Y 4/1) silty clay loam, very dark gray (5Y 3/1) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.
Cg1—35 to 49 inches; olive gray (5Y 5/2) silty clay loam, dark olive gray (5Y 3/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; moderately alkaline; clear wavy boundary.
Cg2—49 to 60 inches; olive gray (5Y 5/2) silty clay loam, olive gray (5Y 4/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over sandy or gravelly material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or neutral
Value—4 to 8 (2 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam

Langhei Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 25 to 40 percent

Typical Pedon

Langhei clay loam, in an area of Buse-Langhei complex, 15 to 40 percent slopes, 1,290 feet east and 170 feet north of the southwest corner of sec. 16, T. 115 N., R. 51 W.

A—0 to 4 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; about 5 percent pebbles; strong effervescence; slightly alkaline; clear wavy boundary.
C1—4 to 15 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine accumulations of carbonate; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.
C2—15 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 5 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—clay loam or loam

C horizon:
Hue—10YR or 2.5Y
Value—5 to 8 (4 to 7 moist)
Chroma—2 to 4
Texture—loam or clay loam

La Prairie Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

La Prairie loam, 90 feet west and 1,850 feet south of the northeast corner of sec. 11, T. 113 N., R. 51 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.
A—10 to 17 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
Bw1—17 to 27 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
Bw2—27 to 35 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
Bw3—35 to 45 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; strong effervescence; slightly alkaline; clear wavy boundary.
C1—45 to 49 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; clear wavy boundary.
C2—49 to 55 inches; grayish brown (2.5Y 5/2) silty

clay loam, dark grayish brown (2.5Y 4/2) moist; many fine faint light brownish gray (2.5Y 6/2) mottles; massive; hard, very friable, slightly sticky and slightly plastic; strong effervescence; slightly alkaline; clear wavy boundary.

Ab—55 to 60 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; many fine faint light brownish gray (2.5Y 6/2) mottles; massive; hard, very friable, slightly sticky and slightly plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 50 inches
Depth to carbonates: 0 to 40 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over clayey or sandy material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, silt loam, clay loam, or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 3
Texture—loam, clay loam, silt loam, or silty clay loam

C horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—loam, clay loam, silt loam, or silty clay loam

Lowe Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 1 percent

Typical Pedon

Lowe loam, 70 feet west and 1,040 feet north of the southeast corner of sec. 24, T. 113 N., R. 51 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and plastic; common fine roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

A—7 to 12 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and plastic; common fine roots; strong effervescence; slightly alkaline; abrupt wavy boundary.

Bk1—12 to 20 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common fine roots; strong effervescence; moderately alkaline; clear wavy boundary.

Bk2—20 to 29 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; few fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C—29 to 35 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; few fine faint yellowish brown (10YR 5/4) mottles; slightly hard, very friable; common fine roots; strong effervescence; slightly alkaline; abrupt wavy boundary.

Ab—35 to 42 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and plastic; slight effervescence; slightly alkaline; clear wavy boundary.

C´—42 to 60 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/3) moist; common medium prominent brownish yellow (10YR 6/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material
Depth to gypsum and other salts: 29 to more than 60 inches
Other features: Some pedons do not have an Ab horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)

Chroma—0 or 1
Texture—loam, clay loam, silt loam, or silty clay loam

Bk horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—loam, clay loam, or silt loam

C horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 3
Texture—loam, clay loam, sandy loam, silty clay loam, sandy clay loam, or loamy sand

Maddock Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Moraines
Parent material: Sandy glaciofluvial sediments
Slope: 6 to 9 percent

Typical Pedon

Maddock sandy loam, in an area of Egeland-Maddock sandy loams, 6 to 9 percent slopes, 80 feet south and 985 feet east of the northwest corner of sec. 29, T. 114 N., R. 51 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) sandy loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; soft, very friable; common fine roots; neutral; abrupt smooth boundary.
A—5 to 9 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable; few fine roots; slightly alkaline; clear smooth boundary.
Bw1—9 to 15 inches; dark brown (10YR 4/3) loamy sand, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable; few very fine roots; slightly alkaline; clear smooth boundary.
Bw2—15 to 24 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; single grain; loose; slightly alkaline; clear smooth boundary.
C—24 to 60 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grain; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 0 to 40 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1 or 2
Texture—sandy loam, loam, loamy fine sand, loamy sand, or fine sandy loam

Bw horizon:
Hue—10YR
Value—4 to 6 (2 to 5 moist)
Chroma—2 to 4
Texture—fine sand, loamy fine sand, or loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—4 to 7 (3 to 6 moist)
Chroma—2 to 4
Texture—fine sand, loamy fine sand, loamy sand, or sand

Marysland Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Flood plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Marysland loam, 1,630 feet north and 120 feet east of the southwest corner of sec. 2, T. 115 N., R. 52 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.
Ak—9 to 14 inches; dark gray (N 4/0) loam, very dark gray (N 3/0) moist; moderate coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; violent effervescence; moderately alkaline; clear wavy boundary.

Figure 10.—Profile of Barnes loam. This well drained soil formed in loamy glacial till. It is dark to a depth of about 15 inches and has accumulations of calcium carbonate below a depth of 17 inches. Depth is marked in feet.

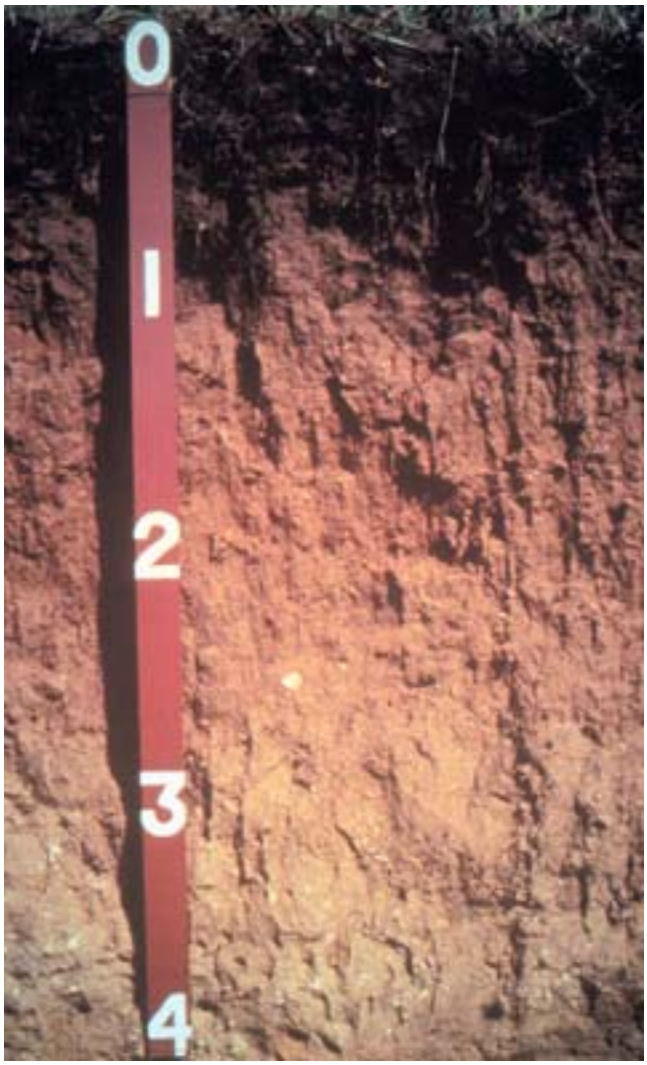

Figure 11.—Profile of Brandt silty clay loam. This well drained soil formed in loess and in the underlying gravelly glacial outwash. It is dark to a depth of about 12 inches. Accumulations of calcium carbonate are below a depth of 30 inches. Depth is marked in feet.

Figure 12.—Profile of Brookings silty clay loam. This moderately well drained soil formed in loess and in the underlying loamy glacial till. It is dark to a depth of about 32 inches and has accumulations of calcium carbonate below this depth. Depth is marked in feet.

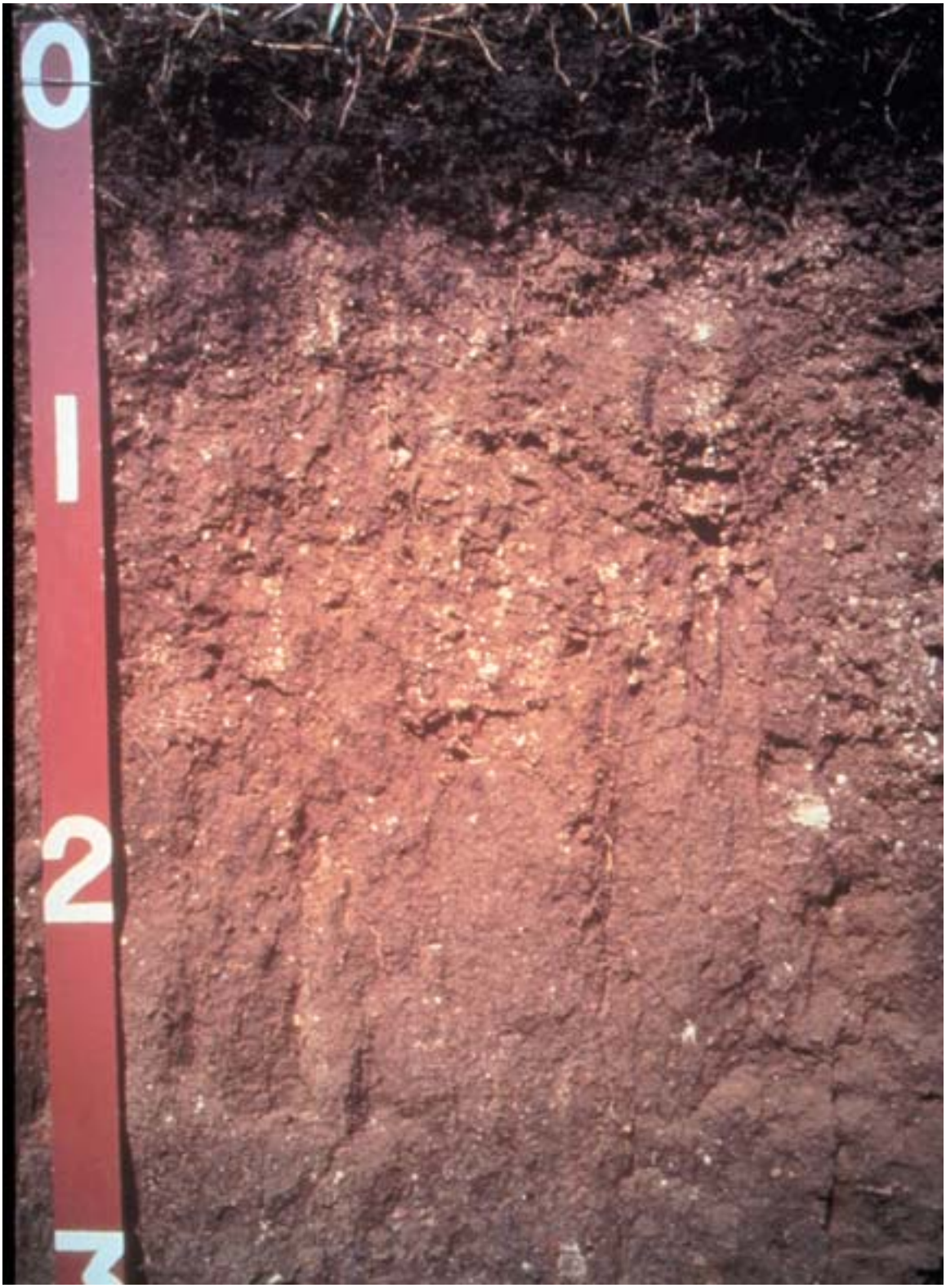

Figure 13.—Profile of Buse loam. This well drained soil formed in loamy glacial till. It is dark to a depth of about 6 inches and is calcareous throughout. Depth is marked in feet.

Figure 14.—Profile of Estelline silt loam. This well drained soil formed in loess and in the underlying gravelly glacial outwash. It is dark to a depth of about 16 inches and is calcareous below a depth of 29 inches. Depth is marked in feet.

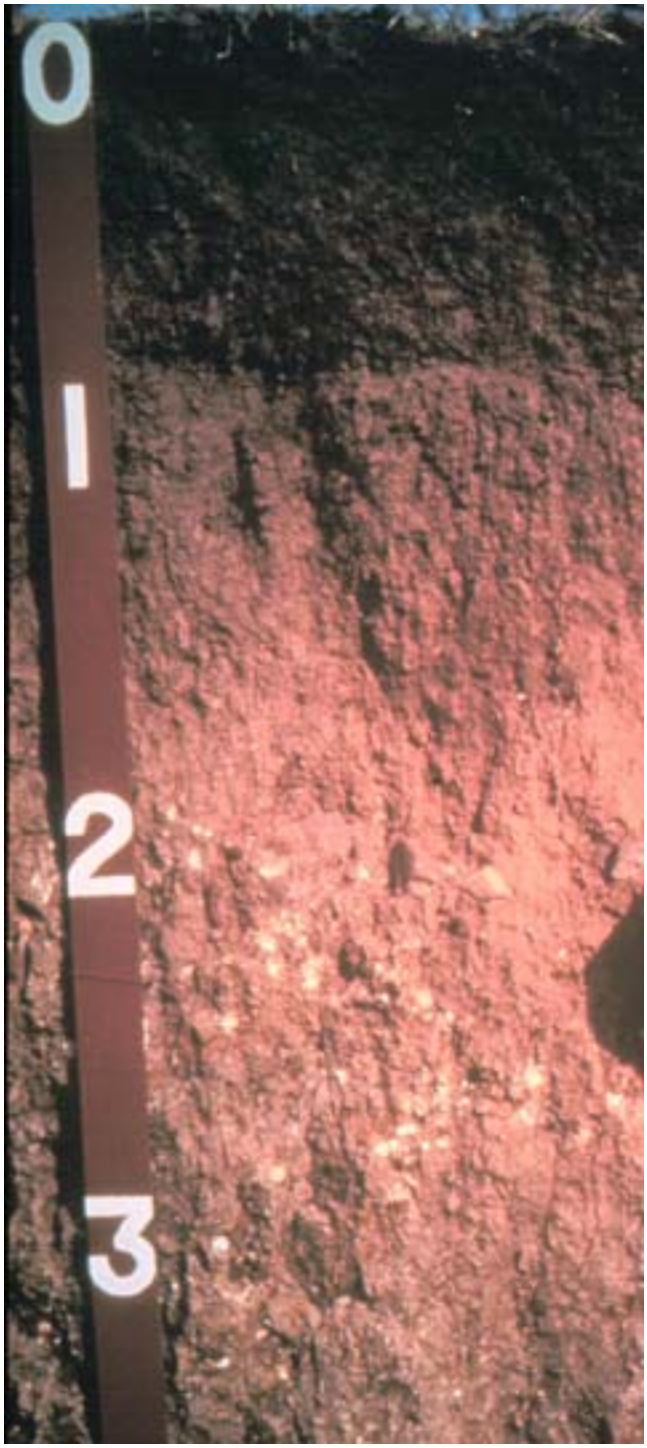

Figure 15.—Profile of Kranzburg silty clay loam. This well drained soil formed in loess and in the underlying loamy glacial till. It is dark to a depth of about 15 inches and has accumulations of calcium carbonate below a depth of 23 inches. Depth is marked in feet.

Bkg1—14 to 23 inches; gray (5Y 5/1) loam, very dark gray (5Y 3/1) moist; moderate coarse and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; violent effervescence; moderately alkaline; abrupt wavy boundary.
2Bkg2—23 to 38 inches; light olive gray (5Y 6/2) gravelly loam, olive gray (5Y 5/2) moist; common fine faint olive (5Y 5/4) mottles; single grain; loose; about 15 percent gravel; violent effervescence; moderately alkaline; clear wavy boundary.
2Cg1—38 to 55 inches; light brownish gray (2.5Y 6/2) very gravelly sand, grayish brown (2.5Y 5/2) moist; common fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; about 36 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.
2Cg2—55 to 60 inches; light brownish gray (2.5Y 6/2) very gravelly sand, grayish brown (2.5Y 5/2) moist; many coarse prominent reddish yellow (7.5YR 6/6) mottles; single grain; loose; about 38 percent gravel; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 30 inches
Depth to carbonates: 0 to 7 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons do not have a 2Bkg horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, silt loam, sandy clay loam, or clay loam

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—4 to 8 (3 to 6 moist)
Chroma—0 to 2
Texture—loam, clay loam, sandy clay loam, fine sandy loam, or sandy loam

2Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—very gravelly sand, fine sand, sand, coarse sand, loamy sand, loamy coarse sand, gravelly sand, gravelly coarse sand, or very gravelly coarse sand

Mauvais Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Wave-cut platforms
Parent material: Loamy glacial till
Slope: 0 to 3 percent

Typical Pedon

Mauvais clay loam, 0 to 2 percent slopes, 2,060 feet south and 1,935 feet east of the northwest corner of sec. 33, T. 114 N., R. 55 W.

A—0 to 5 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; about 5 percent pebbles; strong effervescence; moderately alkaline; abrupt wavy boundary.
C—5 to 18 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; about 5 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.
Cg—18 to 22 inches; gray (5Y 6/1) loam, dark gray (5Y 4/1) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; about 10 percent pebbles; violent effervescence; moderately alkaline; abrupt wavy boundary.
Czg1—22 to 38 inches; light gray (5Y 7/2) clay loam, olive gray (5Y 5/2) moist; many fine prominent yellow (10YR 7/6) and few medium prominent yellowish red (5YR 4/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine nests of salt; about 5 percent pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.
Czg2—38 to 60 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 5/2) moist; many medium prominent reddish yellow (7.5YR 6/8) and many medium prominent yellowish brown (10YR 5/8) mottles; massive; very hard, firm, slightly sticky and slightly plastic; many salts in seams; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to carbonates: 0 to 6 inches

Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: 10 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam, loam, silty clay loam, silt loam, or sandy loam

C horizon:
Hue—2.5Y, 5Y, or neutral
Value—5 to 7 (4 to 6 moist)
Chroma—0 to 4
Texture—loam, clay loam, silt loam, or silty clay loam

McIntosh Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Parent material: Loess over loamy glacial till
Slope: 0 to 2 percent

Typical Pedon

McIntosh silty clay loam, in an area of McIntosh-Lamoure silty clay loams, 2,250 feet east and 300 feet south of the northwest corner of sec. 35, T. 114 N., R. 50 W., in Deuel County:

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; slight effervescence; slightly alkaline; abrupt smooth boundary.
Bk1—9 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) wormcasts; common fine accumulations of carbonate; violent effervescence; slightly alkaline; clear wavy boundary.
Bk2—16 to 29 inches; light brownish gray (2.5Y 6/2) silt loam, light olive brown (2.5Y 5/4) moist; weak coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine accumulations of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.
2C1—29 to 37 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; about 4 percent pebbles; strong effervescence; moderately alkaline; clear wavy boundary.
2C2—37 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; common fine and medium prominent strong brown (7.5YR 5/6) mottles; massive; very hard, firm, slightly sticky and slightly plastic; about 6 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Carbonates: At the surface
Depth to contrasting or impervious layer: 24 to 40 inches over loamy glacial till
Depth to gypsum and other salts: 10 to more than 60 inches

A horizon:
Hue—10YR or 2.5Y
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silty clay loam or silt loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, or loam

2C horizon:
Hue—2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—3 to 6
Texture—loam or clay loam

Minnewaukan Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Rapid
Landform: Beaches
Parent material: Sandy lacustrine sediments
Slope: 0 to 3 percent

Typical Pedon

Minnewaukan loamy sand, 830 feet east and 650 feet south of the northwest corner of sec. 14, T. 113 N., R. 52 W.

A—0 to 5 inches; dark gray (10YR 4/1) loamy sand, black (10YR 2/1) moist; weak fine subangular blocky and weak fine granular structure; loose, very friable; many fine roots; slightly alkaline; clear wavy boundary.
AC—5 to 9 inches; dark gray (10YR 4/1) loamy sand, very dark gray (10YR 3/1) moist; single grain; loose; common fine roots; very slight effervescence; slightly alkaline; clear wavy boundary.
C1—9 to 12 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) medium and coarse sand, dark grayish brown (2.5Y 4/2) and light brownish gray (2.5Y 6/2) moist; single grain; loose; few very fine roots; very slight effervescence; slightly alkaline; clear wavy boundary.
C2—12 to 17 inches; light brownish gray (10YR 6/2) and gray (10YR 5/1) medium and coarse sand, light brownish gray (2.5Y 6/2) and very dark gray (10YR 3/1) moist; single grain; loose; 1-inch strata of very coarse sand; slight effervescence; moderately alkaline; abrupt wavy boundary.
C3—17 to 60 inches; light brownish gray (2.5Y 6/2) coarse to fine sand, light brownish gray (2.5Y 6/2) moist; single grain; loose; very slight effervescence; slightly alkaline.

Range in Characteristics

Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy material
Depth to gypsum and other salts: 30 to more than 60 inches

A horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 6 (2 to 4 moist)
Chroma—1 or 2
Texture—loamy sand, loamy fine sand, loamy coarse sand, fine sandy loam, sandy loam, or sand

C horizon:
Hue—10YR, 2.5Y, 5Y, or 5GY
Value—4 to 7 (3 to 5 moist)
Chroma—1 to 4
Texture—loamy sand, sand, or fine sand

Moritz Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Loamy alluvium
Slope: 0 to 2 percent

Typical Pedon

Moritz loam, in an area of Moritz-Lamoure complex, 110 feet north and 100 feet west of the southeast corner of sec. 30, T. 113 N., R. 50 W., in Deuel County:

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; strong effervescence (about 10 percent calcium carbonate equivalent); slightly alkaline; abrupt smooth boundary.
ABk—9 to 13 inches; dark gray (10YR 4/1) and light brownish gray (2.5Y 6/2) clay loam, very dark gray (10YR 3/1) and grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine vesicular and tubular pores; many medium and coarse soft accumulations of carbonate; violent effervescence (about 30 percent calcium carbonate equivalent); moderately alkaline; abrupt irregular boundary.
Bk1—13 to 26 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine vesicular and tubular pores; many fine soft accumulations of carbonate; violent effervescence (about 30 percent calcium carbonate equivalent); moderately alkaline; gradual wavy boundary.
Bk2—26 to 44 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine vesicular and tubular pores; many fine soft accumulations of carbonate; violent effervescence (about 25 percent calcium carbonate equivalent); moderately alkaline; clear wavy boundary.
Bk3—44 to 54 inches; light olive gray (5Y 6/2) loam, olive (5Y 5/3) moist; common fine distinct olive brown (2.5Y 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; common fine vesicular and tubular pores; many fine soft accumulations of carbonate; violent effervescence (about 15 percent calcium

carbonate equivalent); moderately alkaline; abrupt wavy boundary.
C—54 to 60 inches; light olive gray (5Y 6/2), stratified loam and sandy loam, olive gray (5Y 5/2) moist; common fine distinct light olive brown (2.5Y 5/6) mottles; massive; slightly hard, very friable; few fine vesicular and tubular pores; common fine accumulations of carbonate; strong effervescence (about 10 percent calcium carbonate equivalent); moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 24 inches
Depth to carbonates: 0 to 6 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have an Ab horizon.

A horizon:
Hue—10YR or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, clay loam, silty clay loam, or silt loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 to 3
Texture—loam, clay loam, silt loam, silty clay loam, or sandy loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 or 5 moist)
Chroma—2 to 4
Texture—stratified loam, sandy loam, silt loam, loamy sand, clay loam, or silty clay loam

Oldham Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Oldham silty clay loam, 420 feet east and 320 feet north of the southwest corner of sec. 33, T. 114 N., R. 55 W.

A—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; neutral; gradual wavy boundary.
Bg—9 to 24 inches; gray (5Y 5/1) silty clay loam, very dark gray (5Y 3/1) moist; weak coarse prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; strong effervescence; slightly alkaline; gradual irregular boundary.
Bkg1—24 to 35 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; many fine distinct grayish brown (2.5Y 5/2) and many medium distinct light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to weak fine subangular blocky; hard, firm, sticky and plastic; common fine roots; many fine and medium nests of gypsum; strong effervescence; slightly alkaline; clear wavy boundary.
Bkg2—35 to 44 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; many fine prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common medium accumulations of carbonate; strong effervescence; slightly alkaline; clear wavy boundary.
Cg—44 to 52 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; few coarse prominent light olive brown (2.5Y 5/4) and many medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; few medium accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.
Ab—52 to 57 inches; gray (5Y 5/1) silty clay loam, dark gray (5Y 4/1) moist; massive; hard, friable, slightly sticky and slightly plastic; strong effervescence; moderately alkaline; abrupt wavy boundary.
C´g—57 to 60 inches; light olive gray (5Y 6/2) silty clay loam, gray (5Y 5/1) moist; many medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, firm, sticky and plastic; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till

Depth to gypsum and other salts: 20 to more than 60 inches
Other features: Some pedons do not have an Ab horizon; some pedons have a Bk or Bky horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silty clay

Bkg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 5 moist)
Chroma—0 to 2
Texture—silty clay loam or silty clay

Cg horizon:
Hue—2.5Y or 5Y
Value—4 to 7 (3 to 5 moist)
Chroma—1 or 2
Texture—silty clay loam, silt loam, clay loam, or silty clay

Parnell Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Parnell silty clay loam, 2,415 feet north and 2,260 feet east of the southwest corner of sec. 11, T. 113 N., R. 52 W.

A1—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; many fine prominent strong brown (7.5YR 5/6) mottles; weak thin platy and weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.
A2—10 to 18 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak thin platy structure parting to weak fine granular; hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.
Btg1—18 to 28 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; shiny films on faces of peds; many fine roots; neutral; clear wavy boundary.
Btg2—28 to 38 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; extremely hard, firm, sticky and plastic; shiny films on faces of peds; common fine roots; neutral; gradual wavy boundary.
Cg1—38 to 49 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; massive; extremely hard, firm, sticky and plastic; few fine roots; neutral; gradual wavy boundary.
Cg2—49 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; many medium prominent strong brown (7.5YR 5/6) mottles; massive; extremely hard, firm, sticky and plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Depth to carbonates: 35 to more than 60 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, loam, or silty clay

Btg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—silty clay, silty clay loam, clay loam, or clay

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 7 (3 to 6 moist)
Chroma—1 or 2
Texture—silty clay, clay loam, silty clay loam, clay, or loam

Playmoor Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Moderately slow

Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Playmoor silty clay loam, 2,345 feet south and 75 feet west of the northeast corner of sec. 9, T. 114 N., R. 54 W.

Az—0 to 8 inches; very dark gray (5Y 3/1) silty clay loam, black (5Y 2/1) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; common fine accumulations of salts; strong effervescence; moderately alkaline; clear wavy boundary.

Bzg1—8 to 22 inches; dark gray (5Y 4/1) silt loam, black (5Y 2/1) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable, slightly sticky and slightly plastic; many fine roots; many fine accumulations of salts; strong effervescence; moderately alkaline; gradual wavy boundary.

Bzg2—22 to 30 inches; gray (5Y 5/1) silt loam, very dark gray (5Y 3/1) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; many fine nests of gypsum and other salts; strong effervescence; moderately alkaline; abrupt wavy boundary.

Cg1—30 to 44 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 4/2) moist; common fine distinct strong brown (7.5YR 5/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few medium nests of gypsum; strong effervescence; moderately alkaline; clear wavy boundary.

Cg2—44 to 60 inches; light gray (5Y 7/1) silt loam, olive gray (5Y 5/2) moist; many medium prominent strong brown (7.5YR 4/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; few medium accumulations of carbonate; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Carbonates: At the surface
Depth to contrasting or impervious layer: 40 to more than 60 inches over glacial till or gravelly material
Depth to gypsum and other salts: 0 to 7 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Bz horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 7 (2 to 4 moist)
Chroma—0 or 1
Texture—silty clay loam or silt loam

Cg horizon:
Hue—2.5Y, 5Y, or neutral
Value—5 to 7 (3 to 6 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam

Poinsett Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Till plains and moraines
Parent material: Silty glacial till or loess
Slope: 0 to 15 percent

Typical Pedon

Poinsett silty clay loam, in an area of Poinsett-Buse-Waubay complex, 1 to 6 percent slopes, 310 feet east and 100 feet south of the northwest corner of sec. 17, T. 114 N., R. 54 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt smooth boundary.

Bw1—9 to 13 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt wavy boundary.

Bw2—13 to 18 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.

Bk—18 to 25 inches; light yellowish brown (2.5Y 6/3) silt loam, olive brown (2.5Y 4/3) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard,

friable, slightly sticky and slightly plastic; common fine roots; common medium accumulations of carbonate; violent effervescence; slightly alkaline; clear wavy boundary.

C1—25 to 58 inches; light yellowish brown (2.5Y 6/3) silt loam, olive brown (2.5Y 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium prominent dark brown (7.5YR 4/4) iron stains; few fine roots; strong effervescence; slightly alkaline; gradual wavy boundary.

C2—58 to 60 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few medium prominent dark brown (7.5YR 4/4) iron stains; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam, silt loam, or clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, or clay loam

Bk horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—6 or 7 (5 or 6 moist)
Chroma—1 to 4
Texture—silt loam, loam, or silty clay loam

Rauville Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Silty alluvium
Slope: 0 to 1 percent

Typical Pedon

Rauville silty clay loam, 2,015 feet south and 120 feet west of the northeast corner of sec. 22, T. 113 N., R. 54 W.

A1—0 to 9 inches; gray (5Y 5/1) silty clay loam, black (5Y 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; hard, friable, slightly sticky and plastic; many fine roots; many fine accumulations of carbonate; strong effervescence; moderately alkaline; abrupt wavy boundary.

A2—9 to 32 inches; gray (N 5/0) silt loam, very dark gray (N 3/0) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few snail-shell fragments; strong effervescence; moderately alkaline; abrupt wavy boundary.

A3—32 to 37 inches; very dark gray (N 3/0) silty clay loam, black (N 2/0) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many snail-shell fragments; slight effervescence; moderately alkaline; abrupt wavy boundary.

Cg—37 to 60 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; few fine faint dark brown (10YR 4/3) mottles; massive; extremely hard, firm, sticky and plastic; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to more than 60 inches
Carbonates: At the surface
Depth to contrasting or impervious layer: 40 to more than 60 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a 2C horizon of gravelly material.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—5 to 8 (2 to 6 moist)
Chroma—0 to 2

Texture—silty clay loam, silty clay, silt loam, clay loam, or loam

2C horizon:
Hue—2.5Y or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—gravelly sand, gravelly sandy loam, sandy loam, silt loam, loam, fine sandy loam, or clay loam

Renshaw Series

Depth to bedrock: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains and moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 15 percent

Typical Pedon

Renshaw loam, in an area of Fordville-Renshaw loams, 2 to 6 percent slopes, 1,970 feet south and 160 feet east of the northwest corner of sec. 20, T. 113 N., R. 52 W.

Ap—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; slightly acid; abrupt smooth boundary.
A—4 to 11 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.
Bw—11 to 17 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine roots; neutral; abrupt wavy boundary.
2C—17 to 60 inches; grayish brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose; about 40 percent gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 16 inches
Depth to carbonates: 14 to 20 inches
Depth to contrasting or impervious layer: 14 to 20 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—loam, gravelly loam, sandy loam, stony loam, or very stony loam

Bw horizon:
Hue—10YR
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 4
Texture—loam, sandy loam, sandy clay loam, or gravelly loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly loamy sand, very gravelly loamy sand, gravelly sand, very gravelly sand, gravelly coarse sand, very gravelly coarse sand, or coarse sand

Sioux Series

Depth to bedrock: Very deep
Drainage class: Excessively drained
Permeability: Very rapid
Landform: Moraines
Parent material: Loamy alluvium over glacial outwash
Slope: 6 to 15 percent

Typical Pedon

Sioux gravelly loam, in an area of Sioux-Renshaw complex, 9 to 15 percent slopes, 1,910 feet south and 220 feet east of the northwest corner of sec. 30, T. 113 N., R. 53 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) gravelly loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; about 10 percent gravel; strong effervescence; neutral; abrupt smooth boundary.
C1—7 to 14 inches; brown (10YR 5/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; single grain; loose; few very fine roots; about 45 percent gravel; strong effervescence; slightly alkaline; gradual wavy boundary.
C2—14 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand, dark yellowish brown (10YR 4/4) moist; single grain; loose; about 45 percent gravel; slight effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 14 inches
Depth to carbonates: 0 to 8 inches
Depth to contrasting or impervious layer: 6 to 14 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 to 5 (2 or 3 moist)
Chroma—1
Texture—gravelly loam, sandy loam, gravelly sandy loam, loam, loamy sand, loamy coarse sand, or gravelly loamy sand

C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—gravelly sand, very gravelly sand, gravelly loamy sand, very gravelly sandy loam, very gravelly loamy sand, extremely gravelly sand, very gravelly coarse sand, or extremely gravelly coarse sand

Southam Series

Depth to bedrock: Very deep
Drainage class: Very poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Southam silty clay loam, 40 feet west and 585 feet south of the northeast corner of sec. 34, T. 115 N., R. 55 W.

Ag1—0 to 6 inches; very dark gray (5Y 3/1) silty clay loam, black (5Y 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; slight effervescence; neutral; abrupt wavy boundary.
Ag2—6 to 13 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; many fine roots; many snail-shell fragments; strong effervescence; slightly alkaline; clear wavy boundary.
Ag3—13 to 42 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; common fine roots; few snail-shell fragments; strong effervescence; moderately alkaline; clear wavy boundary.
Ag4—42 to 48 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; common medium prominent olive yellow (2.5Y 6/6) mottles; weak medium subangular blocky structure; extremely hard, firm, sticky and plastic; few snail-shell fragments; strong effervescence; moderately alkaline; clear wavy boundary.
Cg—48 to 60 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 5/2) moist; common fine prominent olive yellow (2.5Y 6/6) mottles; massive; extremely hard, firm, sticky and plastic; common fine nests of gypsum; strong effervescence; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 60 inches
Depth to carbonates: 0 to 10 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: 25 to more than 60 inches
Other features: Some pedons have a 2C horizon.

A horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 to 2
Texture—silty clay loam, silty clay, clay loam, silt loam, or clay

Cg horizon:
Hue—2.5Y, 5Y, 5GY, or neutral
Value—4 to 8 (3 to 7 moist)
Chroma—0 to 2
Texture—silty clay, silty clay loam, clay loam, or clay

Spottswood Series

Depth to bedrock: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate in the loamy sediments and very rapid in the underlying gravelly material
Landform: Outwash plains
Parent material: Loamy alluvium over glacial outwash
Slope: 0 to 2 percent

Typical Pedon

Spottswood loam, 670 feet west and 230 feet north of the southeast corner of sec. 25, T. 113 N., R. 51 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; abrupt smooth boundary.
Bw1—8 to 14 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear wavy boundary.
Bw2—14 to 18 inches; very dark gray (10YR 3/1) loam, very dark brown (10YR 2/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; clear wavy boundary.
Bw3—18 to 26 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; common medium prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; clear wavy boundary.
2C—26 to 60 inches; light yellowish brown (2.5Y 6/3) gravelly loamy sand, olive brown (2.5Y 4/3) moist; common fine distinct yellowish brown (10YR 5/8) mottles; single grain; loose; about 20 percent gravel; slightly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to more than 60 inches
Depth to carbonates: 16 to more than 60 inches
Depth to contrasting or impervious layer: 20 to 40 inches over gravelly material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a Bk or 2Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—clay loam, loam, silt loam, fine sandy loam, or sandy loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—sand, gravelly loamy sand, gravelly sand, or very gravelly sand

Strayhoss Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderate in the loamy sediments and rapid in the underlying sandy material
Landform: Till plains
Parent material: Silty and loamy eolian material over sandy eolian material
Slope: 2 to 6 percent

Typical Pedon

Strayhoss loam, 2 to 6 percent slopes, 2,385 feet east and 108 feet north of the southwest corner of sec. 34, T. 113 N., R. 51 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; few fine pores; slightly acid; abrupt smooth boundary.
Bw1—7 to 13 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few fine and common very fine roots; few fine pores; slightly acid; clear wavy boundary.
Bw2—13 to 21 inches; light olive brown (2.5Y 5/4) silt loam, olive brown (2.5Y 4/4) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; neutral; gradual wavy boundary.
Bw3—21 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; neutral; abrupt wavy boundary.
Bk—30 to 36 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium

subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few fine and common very fine pores; common medium soft masses of carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

2C1—36 to 42 inches; pale yellow (2.5Y 7/4) loamy sand stratified with thin lenses of sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable; strong effervescence; moderately alkaline; gradual wavy boundary.

2C2—42 to 60 inches; light gray (2.5Y 7/2) loamy sand stratified with thin lenses of sandy loam, light olive brown (2.5Y 5/4) moist; single grain; loose; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 10 to 16 inches
Depth to carbonates: 22 to 36 inches
Depth to contrasting or impervious layer: 20 to 40 inches over sandy material
Depth to gypsum and other salts: More than 60 inches
Other features: Some pedons have a 2Bk horizon.

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—loam, silt loam, or silty clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—4 or 5 (3 or 4 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, or loam

Bk horizon:
Hue—10YR or 2.5Y
Value—4 to 6 (3 to 5 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, or loam

2C horizon:
Hue—10YR or 2.5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—loamy sand, loamy fine sand, or fine sand

Svea Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Landform: Moraines
Parent material: Loamy glacial till
Slope: 2 to 6 percent

Typical Pedon

Svea loam, in an area of Barnes-Svea loams, 1 to 6 percent slopes, 2,050 feet west and 200 feet south of the northeast corner of sec. 23, T. 117 N., R. 50 W., in Deuel County:

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable; common very fine roots; slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

A—9 to 17 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; about 2 percent pebbles; neutral; clear wavy boundary.

Bw1—17 to 25 inches; dark gray (10YR 4/1) and brown (10YR 5/3) clay loam, very dark gray (10YR 3/1) and dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; about 3 percent pebbles; neutral; clear wavy boundary.

Bw2—25 to 31 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; few fine prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; about 5 percent pebbles; neutral; abrupt wavy boundary.

Bk—31 to 39 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium prominent yellowish red (5YR 4/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine roots; about 5 percent pebbles; common fine accumulations of carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C—39 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; many fine and medium prominent yellowish red (5YR 5/8) and gray (10YR 6/1) mottles; massive; hard, friable, slightly sticky and slightly plastic; about 5 percent pebbles; common fine accumulations of carbonate; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 28 inches
Depth to carbonates: 20 to 34 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR, 2.5Y, or neutral
Value—3 to 5 (2 or 3 moist)
Chroma—0 or 1
Texture—loam, silt loam, or clay loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam, silt loam, or clay loam

Bk horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 to 8 (4 to 6 moist)
Chroma—1 to 4
Texture—loam or clay loam

C horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—loam or clay loam

Tonka Series

Depth to bedrock: Very deep
Drainage class: Poorly drained
Permeability: Slow
Landform: Till plains
Parent material: Local clayey alluvium
Slope: 0 to 1 percent

Typical Pedon

Tonka silty clay loam, in an area of Cubden-Tonka silty clay loams, 495 feet south and 360 feet west of the northeast corner of sec. 15, T. 114 N., R. 55 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; abrupt smooth boundary.
E—10 to 18 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine faint dark brown (10YR 4/3) mottles; weak thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt wavy boundary.
Bt—18 to 40 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to medium and fine subangular blocky; slightly hard, firm, sticky and plastic; shiny films on faces of peds; neutral; clear wavy boundary.
BC—40 to 45 inches; grayish brown (10YR 5/2) and light brownish gray (2.5Y 6/2) silty clay, dark gray (10YR 4/1) and dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; neutral; clear wavy boundary.
Cg—45 to 60 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; many medium prominent strong brown (7.5YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 20 to 50 inches
Depth to carbonates: 20 to more than 60 inches
Depth to contrasting or impervious layer: More than 60 inches
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR or neutral
Value—3 or 4 (2 or 3 moist)
Chroma—0 or 1
Texture—silty clay loam, silt loam, loam, or clay loam

E horizon:
Hue—10YR, 2.5Y, or neutral
Value—5 to 7 (3 to 5 moist)
Chroma—0 to 2
Texture—loam, silt loam, very fine sandy loam, or silty clay loam

Bt horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 or 2
Texture—clay loam, silty clay loam, silty clay, or clay

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—3 to 7 (2 to 6 moist)
Chroma—1 to 6
Texture—silty clay loam, clay loam, loam,

silty clay, clay, silt loam, or sandy clay loam

Vienna Series

Depth to bedrock: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains and moraines
Parent material: Loess or silty glacial till over loamy glacial till
Slope: 0 to 9 percent

Typical Pedon

Vienna silt loam, in an area of Vienna-Brookings complex, 1 to 6 percent slopes, 1,995 feet north and 195 feet east of the southwest corner of sec. 11, T. 114 N., R. 51 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt smooth boundary.
A—7 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.
Bw1—10 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; neutral; gradual wavy boundary.
2Bw2—16 to 21 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; about 4 percent pebbles; neutral; clear wavy boundary.
2Bk1—21 to 25 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine accumulations of carbonate; about 5 percent pebbles; violent effervescence; moderately alkaline; clear wavy boundary.
2Bk2—25 to 44 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common fine accumulations of carbonate; about 7 percent pebbles; violent effervescence; moderately alkaline; gradual wavy boundary.
2C—44 to 60 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; few fine distinct yellowish brown (10YR 5/6) mottles; massive; hard, friable, sticky and plastic; about 5 percent pebbles; strong effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 8 to 16 inches
Depth to carbonates: 14 to 30 inches
Depth to contrasting or impervious layer: 10 to 20 inches over loamy glacial till
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1 or 2
Texture—silt loam, silty clay loam, or loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—silt loam, silty clay loam, clay loam, or loam

2Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (2 to 4 moist)
Chroma—1 to 4
Texture—loam or clay loam

2Bk horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (4 or 5 moist)
Chroma—3 or 4
Texture—loam or clay loam

2C horizon:
Hue—10YR or 2.5Y
Value—6 or 7 (5 or 6 moist)
Chroma—2 to 4
Texture—loam or clay loam

Waubay Series

Depth to bedrock: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Till plains
Parent material: Silty glacial till or loess
Slope: 0 to 6 percent

Typical Pedon

Waubay silty clay loam, 1,210 feet south and 150 feet east of the northwest corner of sec. 1, T. 113 N., R. 53 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine roots; neutral; abrupt smooth boundary.

A—10 to 14 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; neutral; clear wavy boundary.

Bw1—14 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral; gradual wavy boundary.

Bw2—22 to 29 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tongues of very dark grayish brown (10YR 3/2 moist); slightly alkaline; gradual wavy boundary.

Bk1—29 to 36 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

Bk2—36 to 48 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine accumulations of carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C—48 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light olive brown (2.5Y 5/4) moist; common fine distinct brownish yellow (10YR 6/6) mottles; massive; hard, friable, slightly sticky and slightly plastic; slight effervescence; moderately alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 16 to 35 inches
Depth to carbonates: 20 to 36 inches
Depth to contrasting or impervious layer: 40 to more than 60 inches over loamy glacial till
Depth to gypsum and other salts: More than 60 inches

A horizon:
Hue—10YR
Value—3 or 4 (2 or 3 moist)
Chroma—1
Texture—silty clay loam or silt loam

Bw horizon:
Hue—10YR or 2.5Y
Value—3 to 5 (3 or 4 moist)
Chroma—1 to 3
Texture—silt loam or silty clay loam

Bk horizon:
Hue—2.5Y
Value—5 or 6 (4 or 5 moist)
Chroma—2 to 4
Texture—silt loam or silty clay loam

C horizon:
Hue—2.5Y or 5Y
Value—5 to 7 (4 to 6 moist)
Chroma—2 to 4
Texture—silt loam, silty clay loam, loam, very fine sandy loam, fine sand, or clay

Formation of the Soils

Soil forms when chemical and physical processes act on geologically deposited or accumulated material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil having genetically related horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. The following paragraphs relate the factors of soil formation to the soils in Hamlin County.

Climate

Climate directly influences the rate of chemical and physical weathering. Hamlin County has a continental climate marked by cold winters and hot summers. This climate favors the growth of grasses and the resulting accumulation of organic matter in the upper part of the soil. The precipitation is sufficient to leach carbonates in most soils to an average depth of about 18 to 20 inches. The climate is generally uniform throughout the county; thus, as a separate factor, it has not had a significant effect on the formation of the soils.

Plant and Animal Life

Plants, animals, insects, earthworms, bacteria, and fungi have an important effect on soil formation. They cause gains in organic matter, gains or losses in plant nutrients, and changes in soil structure and porosity. In Hamlin County the tall and mid prairie grasses have had more influence than other living organisms on soil formation. As a result of these grasses, the surface layer of many soils has a moderate or high content of organic matter.

Earthworms, insects, and burrowing animals help to keep the soil open and porous. Bacteria, actinomycetes, and fungi decompose plant residue, thus releasing nutrients that plants use as food.

Parent Material

Most of the soils in Hamlin County formed in glacial material derived from preglacial formations of gneiss, granite, limestone, sandstone, siltstone, and shale. The glacier ground up and mixed this material. The resultant mass is an aggregate of sand, silt, clay, and some rock fragments. When the glacier melted, the glacial material was redeposited. Some deposits consist of unsorted materials, or glacial till. The material in other deposits either was sorted by water as the material was deposited or was sorted by wind and deposited on an older landscape.

The county is mainly on the Prairie Coteau (Coteau des Prairies). The eastern part of the county generally is nearly level to strongly sloping and has a well defined drainage system of rivers and creeks. In this physiographic area, deposits of glacial till of early Wisconsin age overlie Cretaceous bedrock (Flint, 1955). These deposits are as much as several hundred feet in thickness. The glacial till was dissected and in many areas was covered by a thin mantle of loess or eolian sandy material. The western part of the county generally is gently undulating to hilly and has many potholes, sloughs, and lakes. In

this physiographic area, glacial deposits of late Wisconsin age, as much as several hundred feet in thickness, overlie Cretaceous bedrock. The late Wisconsin deposits consist mainly of poorly sorted glacial till, sorted silty glacial deposits, stratified glacial outwash, and alluvial sediment.

The glacial till throughout the county is brownish to yellowish loam to clay loam. It is friable or firm. Barnes, Buse, Langhei, Mauvais, and Svea soils formed in this loamy glacial till.

In the eastern part of the county, many areas have a thin mantle of loess that overlies the glacial till in the nearly level to moderately sloping upland areas. Brookings, Kranzburg, McIntosh, and Vienna soils formed in this material. The Poinsett and Waubay soils in this area formed in thicker deposits of loess.

In the western part of the county, glacial till was deposited on glacial ice and then reworked by water as the glacier melted. Cubden, Poinsett, and Waubay soils formed in this silty glacial till.

Also in the western part of the county, ice-walled lake plains formed where a superglacial stream terminated in a lake. The finer textured material settled in the lake, and after a time the sediments became very thick. Hetland soils formed in these sediments. As the glacial ice melted, a formation resembling a mesa remained. The former ice-walled lake plains are higher than the surrounding landscape.

Badger, Oldham, Parnell, Southam, and Tonka soils formed partly or entirely in local alluvium that washed from adjacent upland soils. Castlewood, Fairdale, LaDelle, Lamoure, La Prairie, Lowe, Moritz, and Playmoor soils formed in alluvium deposited by streams.

Glacial outwash material consisting of sand, gravel, and loamy material is scattered throughout the county. This material was deposited by glacial meltwater. Arvilla, Divide, Fordville, and Renshaw soils formed in loamy material underlain by gravelly material. Brandt and Estelline soils formed in silty sediments that are underlain by gravelly material. Egeland, Embden, and Maddock soils are in areas where the sandy outwash or eolian sediment is more than 40 inches thick.

Relief

Relief affects soil formation through its influence on drainage, runoff, erosion, plant cover, and soil temperature. On the more sloping soils, such as Buse and Langhei soils, much of the rainfall is lost through runoff and does not penetrate the surface. Much of the surface soil is lost through erosion. As a result, these soils have a thin surface layer and are calcareous at or near the surface.

Runoff is slower on Barnes, Brandt, Estelline, Kranzburg, Poinsett, Vienna, and other less sloping soils, and more rainfall penetrates the surface. These soils are calcareous at a greater depth than the Buse and Langhei soils. Also, the horizons in which organic matter accumulates are thicker.

Brookings, Svea, and Waubay soils are on footslopes that receive extra moisture in the form of runoff from adjacent soils. The layers in which organic matter accumulates are thicker than those in the Barnes, Kranzburg, and Poinsett soils. Also, calcium carbonate is leached to a greater depth. In low areas where drainage is impeded, the fluctuating water table favors the concentration of calcium carbonate and other soluble salts in Colvin, Cubden, Divide, McIntosh, and other soils. Oldham, Parnell, Southam, and Tonka soils are in basins where water is ponded. These soils have the colors characteristic of poorly drained and very poorly drained soils.

Time

The length of time that soil material has been exposed to the other factors of soil formation is reflected in the kinds of soil that have formed. The degree of profile development reflects the age of a soil. The oldest soils are on the parts of the landscape that have been stable for the longest time. In Hamlin County, these are the Barnes, Kranzburg, and Vienna soils. The youngest soils either are those in which natural erosion removes nearly as much soil material as is formed through the weathering of parent material or are alluvial soils, which receive new material each time the area is flooded. Buse and Langhei soils are young soils that are subject to natural erosion. Fairdale, LaDelle, Lamoure, and La Prairie soils are examples of young alluvial soils.

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Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes are commonly steep and linear and descend to a footslope. They are erosional forms produced mainly by mass wasting and running water.

Basin. A depressed area with no surface outlet. Examples are closed depressions in a glacial till plain or lake basin.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual

grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. The thickness of weathered soil material over bedrock. The depth classes recognized in this survey area are as follows:

Very deep	more than 60 inches
Deep	40 to 60 inches
Moderately deep	20 to 40 inches
Shallow	less than 20 inches

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid

than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Footslope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum,

an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Landform. Any physical, recognizable form or feature of the earth's surface, having a characteristic shape and produced by natural causes.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Mesophytic crop. Any crop adapted to grow under medium conditions of moisture.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include part of the subsoil.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to adversely affect the physical condition of the subsoil.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition. In this survey, the classes of organic matter content in

the Ap horizon or the upper 10 inches of the profile are as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	8.0 to 16.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pasture, tame. Grazing land that is planted mainly to introduced or domesticated native forage species and that receives periodic renovation or cultural treatment, such as tillage, fertilization, mowing, weed control, or irrigation.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0

Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shoulder slope. The uppermost inclined surface at the top of a hillslope. It forms the transition zone from backslope to summit of an upland. It is dominantly convex in profile and erosional in origin.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. The slope classes in this survey are as follows:

Level	0 to 1 percent
Nearly level	0 to 2 percent
Gently sloping or undulating	2 to 6 percent
Moderately sloping or gently rolling	6 to 9 percent
Strongly sloping or rolling	9 to 15 percent
Moderately steep or hilly	15 to 25 percent
Steep	more than 25 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of

the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The top or highest level of an upland feature. A high interfluve area of gentler slope that is flanked by steeper hillslopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill; part of a footslope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Transitional layer. A layer of soil that grades to the next layer or includes parts of adjacent layers, commonly between the surface layer and subsoil or underlying layers.

Underlying layer. The C or R horizon; that part of the soil below the subsoil, commonly the parent material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Castlewood, South Dakota)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	22.3	-0.7	10.8	51	-32	0	0.60	0.19	0.98	2	5.2
February	28.6	5.9	17.2	55	-29	1	.62	.22	.96	1	5.3
March	41.1	19.1	30.1	72	-13	35	1.38	.59	2.04	3	6.2
April	58.3	31.9	45.1	88	9	206	2.03	.97	2.95	5	1.5
May	71.2	43.4	57.3	91	21	531	3.07	1.21	4.62	6	.1
June	80.3	53.3	66.8	97	35	789	3.92	1.88	5.68	7	.0
July	86.1	58.5	72.3	100	41	956	3.32	1.38	4.97	5	.0
August	83.9	56.0	69.9	99	37	902	2.68	1.50	3.72	5	.0
September	73.5	45.6	59.6	95	25	567	2.34	1.02	3.46	4	.0
October	61.1	33.7	47.4	84	13	257	1.77	.57	2.96	3	.5
November	41.6	19.8	30.7	70	-10	29	.86	.21	1.37	2	3.3
December	26.6	5.4	16.0	53	-26	0	.57	.27	.89	1	4.8
Yearly:											
Average	56.2	31.0	43.6	---	---	---	---	---	---	---	---
Extreme	107	-40	---	101	-33	---	---	---	---	---	---
Total	---	---	---	---	---	4,274	23.14	18.15	27.64	44	26.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Castlewood, South Dakota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 12	May 19	May 30
2 years in 10 later than--	May 6	May 14	May 25
5 years in 10 later than--	Apr. 24	May 4	May 16
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 25	Sept. 16	Sept. 3
2 years in 10 earlier than--	Sept. 30	Sept. 21	Sept. 9
5 years in 10 earlier than--	Oct. 9	Sept. 30	Sept. 19

Table 3.--Growing Season

(Recorded in the period 1961-90 at Castlewood, South Dakota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	133	122	99
8 years in 10	140	129	107
5 years in 10	155	143	122
2 years in 10	170	156	138
1 year in 10	177	164	146

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
ArA	Arvilla sandy loam, 0 to 2 percent slopes	1,251	0.4
Ba	Badger silty clay loam	364	0.1
BaB	Barnes clay loam, 2 to 6 percent slopes	48	*
BbB	Barnes-Buse loams, 2 to 6 percent slopes	4,453	1.3
BbC	Barnes-Buse loams, 6 to 9 percent slopes	3,943	1.1
BcD	Barnes-Buse-Svea loams, 2 to 15 percent slopes	21	*
BnA	Barnes-Vienna complex, 0 to 2 percent slopes	468	0.1
BrA	Brandt silty clay loam, 0 to 2 percent slopes	6,486	1.9
BrB	Brandt silty clay loam, 2 to 6 percent slopes	3,554	1.0
Bs	Brookings silty clay loam	555	0.2
BtD	Buse-Barnes loams, 9 to 20 percent slopes	4,650	1.4
BuC	Buse-Barnes loams, 2 to 15 percent slopes, very stony	1,069	0.3
BuE	Buse-Barnes loams, 9 to 40 percent slopes, very stony	1,357	0.4
BvD	Buse-Lamoure, channeled, complex, 0 to 40 percent slopes	2,678	0.8
BxE	Buse-Langhei complex, 15 to 40 percent slopes	1,792	0.5
ByC	Buse-Poinsett complex, 6 to 9 percent slopes	7,887	2.3
ByD	Buse-Poinsett complex, 9 to 15 percent slopes	1,745	0.5
Ca	Castlewood silty clay	784	0.2
Co	Colvin-Oldham silty clay loams	1,713	0.5
Cu	Cubden-Badger silty clay loams	17,444	5.1
Cx	Cubden-Tonka silty clay loams	9,187	2.7
Dv	Divide loam	4,236	1.2
EgB	Egeland-Embden complex, 2 to 6 percent slopes	2,670	0.8
EmC	Egeland-Maddock sandy loams, 6 to 9 percent slopes	798	0.2
EsA	Estelline silt loam, 0 to 2 percent slopes	2,201	0.6
EsB	Estelline silt loam, 2 to 6 percent slopes	6,476	1.9
Fa	Fairdale loam, channeled	1,527	0.4
FdA	Fordville loam, 0 to 2 percent slopes	4,695	1.4
FoB	Fordville-Renshaw loams, 2 to 6 percent slopes	3,425	1.0
HeA	Hetland silty clay loam, 0 to 2 percent slopes	1,942	0.6
HeB	Hetland silty clay loam, 2 to 6 percent slopes	1,677	0.5
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes	1,943	0.6
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes	6,101	1.8
La	La Prairie loam	2,525	0.7
Ld	LaDelle silt loam	3,770	1.1
Lm	Lamoure silty clay loam	4,616	1.3
Lr	Lamoure-Rauville silty clay loams, channeled	5,541	1.6
Lw	Lowe loam	451	0.1
Ma	Marysland loam	1,348	0.4
MbA	Mauvais clay loam, 0 to 2 percent slopes	1,206	0.3
Mc	McIntosh-Badger silty clay loams	1,084	0.3
Mn	Minnewaukan loamy sand	618	0.2
Mz	Moritz-Lamoure complex	479	0.1
Oh	Oldham silty clay loam	4,779	1.4
Or	Orthents, gravelly	333	0.1
Pa	Parnell silty clay loam	4,684	1.4
Pm	Playmoor silty clay loam	621	0.2
PoB	Poinsett-Buse complex, 2 to 6 percent slopes	2,234	0.7
PsB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes	59,570	17.2
PsC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes	8,177	2.4
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes	13,448	3.9
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes	47,602	13.8
Ra	Rauville silty clay loam	2,205	0.6
ReA	Renshaw loam, 0 to 2 percent slopes	3,972	1.1
ReB	Renshaw loam, 2 to 6 percent slopes	1,000	0.3
RnC	Renshaw-Brandt complex, 3 to 9 percent slopes	950	0.3
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes	2,930	0.8
SaD	Sioux-Renshaw complex, 9 to 15 percent slopes	1,305	0.4
So	Southam silty clay loam	10,912	3.2
Sp	Spottswood loam	846	0.3
StB	Strayhoss loam, 2 to 6 percent slopes	503	0.1
To	Tonka silty clay loam	1,005	0.3

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
VbA	Vienna-Brookings complex, 0 to 2 percent slopes	5,078	1.5
VbB	Vienna-Brookings complex, 1 to 6 percent slopes	17,520	5.1
VnC	Vienna-Buse complex, 6 to 9 percent slopes	2,056	0.6
W	Water	17,758	5.2
Wa	Waubay silty clay loam	4,182	1.2
	Total	344,448	100.0

* Less than 0.1 percent.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
Ba	Badger silty clay loam (where drained)
BaB	Barnes clay loam, 2 to 6 percent slopes
BbB	Barnes-Buse loams, 2 to 6 percent slopes
BnA	Barnes-Vienna complex, 0 to 2 percent slopes
BrA	Brandt silty clay loam, 0 to 2 percent slopes
BrB	Brandt silty clay loam, 2 to 6 percent slopes
Bs	Brookings silty clay loam
Ca	Castlewood silty clay (where drained)
Cu	Cubden-Badger silty clay loams (where drained)
Cx	Cubden-Tonka silty clay loams (where drained)
Dv	Divide loam
EgB	Egeland-Embden complex, 2 to 6 percent slopes
EsA	Estelline silt loam, 0 to 2 percent slopes
EsB	Estelline silt loam, 2 to 6 percent slopes
FdA	Fordville loam, 0 to 2 percent slopes
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes
La	La Prairie loam
Ld	LaDelle silt loam
Lm	Lamoure silty clay loam (where drained)
Lw	Lowe loam (where drained)
Ma	Marysland loam (where drained)
Mc	McIntosh-Badger silty clay loams
Mz	Moritz-Lamoure complex (where drained)
PoB	Poinsett-Buse complex, 2 to 6 percent slopes
PsB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
Sp	Spottswood clay loam
StB	Strayhoss silt loam, 2 to 6 percent slopes
To	Tonka silty clay loam (where drained)
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
Wa	Waubay silty clay loam

Table 6.--Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Corn	Oats	Alfalfa hay	Bromegrass-alfalfa	Spring wheat	Soybeans	Barley
	Bu	Bu	Tons	AUM*	Bu	Bu	Bu
ArA---- Arvilla	24	32	1.7	1.8	18	9	27
Ba---- Badger	77	54	1.7	3.2	29	29	43
BaB---- Barnes	77	64	3.0	3.1	35	28	51
BbB---- Barnes-Buse	73	61	2.9	3.0	33	26	49
BbC---- Barnes-Buse	59	51	2.5	2.7	28	21	41
BcD---- Barnes-Buse-Svea	51	45	2.5	2.5	25	19	36
BnA---- Barnes-Vienna	85	70	3.2	3.2	38	32	56
BrA---- Brandt	87	71	3.2	3.3	39	32	57
BrB---- Brandt	79	66	3.0	3.1	36	30	52
Bs---- Brookings	98	77	4.0	4.0	42	36	62
BtD---- Buse-Barnes	39	37	2.1	2.2	20	14	30
BuC, BuE. Buse-Barnes							
BvD---- Buse-Lamoure	24	17	1.1	1.7	10	8	14
BxE---- Buse-Langhei	13	15	1.4	1.5	9	4	12
ByC---- Buse-Poinsett	59	52	2.5	2.6	28	21	42
ByD---- Buse-Poinsett	43	41	2.2	2.3	22	16	33
Ca---- Castlewood	60	28	0.4	2.4	15	22	23
Co---- Colvin-Oldham	41	18	0.3	1.7	10	14	15
Cu---- Cubden-Badger	77	54	2.3	3.0	30	26	44

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Oats	Alfalfa hay	Bromegrass-alfalfa	Spring wheat	Soybeans	Barley
	Bu	Bu	Tons	AUM*	Bu	Bu	Bu
Cx---- Cubden-Tonka	69	44	1.8	2.4	24	23	36
Dv---- Divide	68	49	2.3	2.8	28	21	40
EgB---- Egeland-Embden	56	50	2.5	2.6	28	21	42
EmC---- Egeland-Maddock	41	39	2.2	2.3	22	16	33
EsA---- Estelline	64	58	2.7	2.7	32	24	49
EsB---- Estelline	56	55	2.5	2.6	31	21	45
Fa---- Fairdale	35	12	0.4	2.2	6	13	9
FdA---- Fordville	52	50	2.3	2.4	28	20	42
FoB---- Fordville-Renshaw	40	42	2.0	2.1	23	15	35
HeA---- Hetland	84	69	3.1	3.2	38	32	56
HeB---- Hetland	76	65	3.0	3.1	35	29	52
KrA---- Kranzburg-Brookings	93	74	3.5	3.5	40	34	59
KrB---- Kranzburg-Brookings	87	70	3.4	3.4	38	32	56
La---- La Prairie	88	65	2.7	3.6	35	33	52
Ld---- LaDelle	90	66	2.8	3.7	36	33	53
Lm---- Lamoure	70	47	1.2	3.3	26	22	38
Lr---- Lamoure-Rauville	32	10	0.3	1.8	6	10	8
Lw---- Lowe	55	28	0.6	2.8	15	17	23
Ma---- Marysland	46	22	0.4	2.5	13	14	19
MbA---- Mauvais	40	20	0.3	2.2	11	12	16

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Oats	Alfalfa hay	Bromegrass-alfalfa	Spring wheat	Soybeans	Barley
	Bu	Bu	Tons	AUM*	Bu	Bu	Bu
Mc McIntosh-Badger	80	55	2.2	3.1	30	27	44
Mn Minnewaukan	38	23	1.5	1.8	18	15	27
Mz Moritz-Lamoure	71	46	1.8	3.0	25	22	37
Oh Oldham	28	6	---	0.5	4	9	6
Or Orthents	5	11	0.9	0.9	6	2	10
Pa Parnell	28	7	---	0.5	4	10	6
Pm Playmoor	29	10	0.1	1.3	6	8	11
PoB Poinsett-Buse	75	64	2.9	3.0	34	28	51
PsB Poinsett-Buse-Waubay	79	67	3.1	3.2	36	29	53
PsC Poinsett-Buse-Waubay	68	59	2.9	3.0	32	25	47
PwA Poinsett-Waubay	91	75	3.5	3.5	41	35	60
PwB Poinsett-Waubay	85	71	3.3	3.4	38	32	57
Ra Rauville	25	5	---	0.8	3	8	4
ReA Renshaw	28	32	1.8	1.9	18	11	28
ReB Renshaw	23	29	1.8	1.8	16	9	25
RnC Renshaw-Brandt	43	41	2.1	2.2	23	16	34
RsC Renshaw-Sioux	13	20	1.3	1.4	11	5	18
SaD Sioux-Renshaw	5	11	0.9	1.0	6	2	10
So Southam	5	1	---	0.1	1	1	1
Sp Spottswood	75	55	2.8	3.0	30	28	45

See footnote at end of table.

Table 6.--Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Corn	Oats	Alfalfa hay	Bromegrass-alfalfa	Spring wheat	Soybeans	Barley
	Bu	Bu	Tons	AUM*	Bu	Bu	Bu
StB---------- Strayhoss	71	60	2.8	2.9	33	27	49
To---------- Tonka	54	24	0.4	1.6	13	21	19
VbA---------- Vienna-Brookings	89	73	3.4	3.4	39	33	58
VbB---------- Vienna-Brookings	82	68	3.2	3.3	37	30	54
VnC---------- Vienna-Buse	63	55	2.7	2.8	30	23	44
Wa---------- Waubay	95	78	3.9	3.9	42	36	62

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Rangeland Characteristic Vegetation and Productivity

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Limy Subirrigated	Little bluestem	40	5,300	4,400	2,800
Cubden: Cu, Cx	Big bluestem	20			
Divide: Dv	Needlegrasses	20			
McIntosh: Mc	Blue grama	5			
Moritz: Mz	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
Loamy Overflow	Big bluestem	60	5,500	4,600	3,200
Badger: Ba, Cu, Mc	Sedges	10			
Brookings: Bs, KrA, KrB, VbA, VbB	Canada wildrye	5			
	Porcupinegrass	5			
Fairdale: Fa	Little bluestem	5			
La Prairie: La	Sideoats grama	5			
LaDelle: Ld	Switchgrass	5			
Spottswood: Sp	Climax forbs	5			
Waubay: PsB, PwA, PwB, Wa					
Saline Subirrigated	Little bluestem	45	5,300	4,400	3,100
Playmoor: Pm	Big bluestem	20			
	Indiangrass	10			
	Switchgrass	10			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
Sandy	Big bluestem or sand bluestem	35	3,900	3,200	2,200
Egeland: EgB, EmC	Little bluestem	25			
Embden: EgB	Prairie sandreed	15			
Maddock: EmC	Needlegrasses	10			
	Sideoats grama	5			
	Sedges	5			
	Climax forbs	5			
Shallow Marsh	Sedges	45	7,400	6,800	5,400
Parnell: Pa	Rivergrass	30			
	Climax forbs	10			
	American mannagrass	5			
	Reedgrasses	5			
	Prairie cordgrass	5			
Shallow to Gravel	Needleandthread	45	2,900	2,400	1,500
Arvilla: ArA	Little bluestem	10			
Renshaw: FoB, ReA, ReB, RnC, RsC, SaD	Prairie dropseed	10			
	Blue grama or hairy grama	10			
	Plains muhly	5			
	Bluegrasses	5			
	Sedges	5			
	Climax forbs	5			
	Climax shrubs	5			

Table 7.--Rangeland Characteristic Vegetation and Productivity--Continued

Range site, soil name, and map symbols	Potential natural plant community		Potential annual production for kind of growing season		
	Common plant name	Composition	Favorable	Average	Unfavorable
		Pct	Lb/acre	Lb/acre	Lb/acre
Silty----------	Little bluestem----------	30	4,200	3,500	2,400
Barnes: BaB, BbB, BbC, BcD, BnA, BtD, BuC, BuE	Big bluestem----------	20			
	Needlegrasses----------	20			
Brandt: BrA, BrB, RnC	Prairie dropseed----------	5			
Estelline: EsA, EsB	Blue grama----------	5			
Fordville: FdA, FoB	Bluegrasses----------	5			
Hetland: HeA, HeB	Sedges----------	5			
Kranzburg: KrA, KrB	Climax forbs----------	5			
Poinsett: ByC, ByD, PoB, PsB, PsC, PwA, PwB	Climax shrubs----------	5			
Strayhoss: StB					
Svea: BcD					
Vienna: BnA, VbA, VbB, VnC					
Waubay: PsC					
Subirrigated----------	Big bluestem----------	50	5,900	5,400	4,300
Colvin: Co	Indiangrass----------	10			
Lamoure: BvD, Lm, Lr, Mz	Little bluestem----------	10			
Lowe: Lw	Switchgrass----------	10			
Marysland: Ma	Canada wildrye----------	5			
Mauvais: MbA	Prairie cordgrass----------	5			
Minnewaukan: Mn	Sedges----------	5			
	Climax forbs----------	5			
Thin Upland----------	Little bluestem----------	35	3,500	2,900	2,000
Buse: BbB, BbC, BcD, BtD, BuC, BuE, BvD, BxE, ByC, ByD, PoB, PsB, PsC, VnC	Needlegrasses----------	20			
	Big bluestem----------	10			
	Prairie dropseed----------	10			
	Sideoats grama----------	5			
Langhei: BxE	Blue grama----------	5			
	Sedges----------	5			
	Climax forbs----------	5			
	Climax shrubs----------	5			
Very Shallow----------	Needleandthread----------	55	2,200	1,900	1,100
Orthents: Or	Blue grama or hairy grama----	20			
Sioux: RsC, SaD	Sedges----------	10			
	Plains muhly----------	5			
	Sideoats grama----------	5			
	Climax forbs----------	5			
Wetland----------	Prairie cordgrass----------	60	7,000	6,400	5,100
Castlewood: Ca	Reedgrasses----------	10			
Oldham: Co, Oh	Reed canarygrass----------	10			
Rauville: Lr, Ra	Sedges----------	5			
	Switchgrass----------	5			
	Canada wildrye----------	5			
	Bluegrasses----------	5			
Wet Meadow----------	Sedges----------	40	5,000	4,600	3,200
Tonka: Cx, To	Reedgrasses----------	15			
	Prairie cordgrass----------	15			
	Reed canarygrass----------	10			
	Western wheatgrass----------	5			
	Bluegrasses----------	5			
	Rushes----------	5			
	Climax forbs----------	5			

Table 8.--Windbreaks and Environmental Plantings

(In Hamlin County, none of the soils are assigned to windbreak suitability group 7 or 9. The symbol < means less than; > means more than. Dashes indicate that trees generally do not grow to the given height on the soils in that group)

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 1---------- Brookings: Bs, KrA, KrB, VbA, VbB Cubden: Cu, Cx Divide: Dv Embden: EgB Fairdale: Fa La Prairie: La LaDelle: Ld McIntosh: Mc Moritz: Mz Spottswood: Sp Svea: BcD Waubay: PsB, PsC, PwA, PwB, Wa	Golden currant, Hansen hedgerose, juneberry, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	American plum, Amur maple, common chokecherry, common lilac, European cotoneaster, late lilac, sargent crabapple, Siberian apricot, Siberian peashrub, silver buffaloberry, Ussurian pear.	Austrian pine, Black Hills spruce, blue spruce, bur oak, eastern redcedar, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, white spruce.	Golden willow, green ash, hackberry, silver maple*, white poplar, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar, Siberian elm.
Group 2---------- Badger: Ba, Cu, Mc Lamoure: BvD, Lm, Lr, Mz Minnewaukan: Mn	American plum, common lilac, golden currant, Hansen hedgerose, juneberry, late lilac, Mongolian cherry, Peking cotoneaster, redosier dogwood, skunkbush sumac, western sandcherry.	Amur maple, Arnold hawthorn, common chokecherry, European cotoneaster, sargent crabapple, Siberian apricot, Siberian peashrub, Ussurian pear.	Austrian pine, Black Hills spruce, blue spruce, bur oak, eastern redcedar, Manchurian crabapple, ponderosa pine, Rocky Mountain juniper, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, white spruce.	Golden willow, green ash, hackberry, silver maple*, white willow.	Carolina poplar, eastern cottonwood, northwest poplar, plains cottonwood, robusta poplar.
Group 3---------- Barnes: BaB, BbB, BbC, BcD, BnA, BtD Brandt: BrA, BrB, RnC Kranzburg: KrA, KrB Poinsett: ByC, ByD, PoB, PsB, PsC, PwA, PwB Strayhoss: StB Vienna: BnA, VbA, VbB, VnC	Amur honeysuckle, golden currant, Hansen hedgerose, late lilac, Mongolian cherry, Nanking cherry, Peking cotoneaster, redosier dogwood, Russian almond, skunkbush sumac, western sandcherry.	American plum, Amur maple, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, European cotoneaster, Manchurian apricot, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, silver buffaloberry.	Black Hills spruce, blue spruce, bur oak, hackberry, Manchurian crabapple, ponderosa pine, Russian mulberry, Russian-olive, Scotch pine, Siberian crabapple, Ussurian pear, white poplar, white spruce.	Green ash, silver maple.	Siberian elm.

See footnote at end of table.

Table 8.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 4---------- Hetland: HeA, HeB	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, skunkbush sumac.	American plum, common chokecherry, eastern redcedar, common lilac, Manchurian apricot, Manchurian crabapple, Rocky Mountain juniper, Siberian apricot, Siberian crabapple, Siberian peashrub, silver buffaloberry, Ussurian pear.	Bur oak, hackberry, ponderosa pine, Russian-olive.	Green ash, Siberian elm, silver maple.	---
Group 5---------- Egeland: EgB, EmC Maddock: EmC	Amur honeysuckle, European cotoneaster, golden currant, Nanking cherry, Peking cotoneaster, Russian almond, silver buffaloberry, skunkbush sumac, western sandcherry.	American plum, Arnold hawthorn, common chokecherry, common lilac, eastern redcedar, Rocky Mountain juniper, Siberian apricot, Siberian peashrub, Ussurian pear.	Bur oak, green ash, hackberry, Manchurian crabapple, ponderosa pine, Russian-olive, Siberian crabapple, white poplar.	Siberian elm------	---
Group 6---------- Arvilla: ArA Estelline: EsA, EsB Fordville: FdA, FoB Renshaw: FoB, ReA, ReB, RnC, RsC	Amur honeysuckle, common lilac, European cotoneaster, Peking cotoneaster, Siberian peashrub, silver buffaloberry.	Eastern redcedar, hackberry, Manchurian crabapple, Rocky Mountain juniper, Siberian crabapple, Ussurian pear.	Bur oak, green ash, ponderosa pine, Russian-olive.	Siberian elm------	---
Group 8---------- Buse: BbB, BbC, BcD, BtD, ByC, ByD, PoB, PsB, PsC, VnC	American plum, Amur honeysuckle, common lilac, European cotoneaster, golden currant, Peking cotoneaster, Siberian peashrub, silver buffaloberry, skunkbush sumac.	Eastern redcedar, hackberry, Rocky Mountain juniper, Russian-olive, Ussurian pear.	Green ash, ponderosa pine, Siberian elm.	---	---

See footnote at end of table.

Table 8.--Windbreaks and Environmental Plantings--Continued

Windbreak suitability group, soil name, and map symbols	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Group 10	None	None	None	None	None.
Barnes: BuC, BuE					
Buse: BuC, BuE, BvD, BxE					
Castlewood: Ca					
Colvin: Co					
Langhei: BxE					
Lowe: Lw					
Marysland: Ma					
Mauvais: MbA					
Oldham: Co, Oh					
Orthents: Or					
Parnell: Pa					
Playmoor: Pm					
Rauville: Lr, Ra					
Renshaw: SaD					
Sioux: RsC, SaD					
Southam: So					
Tonka: Cx, To					

* Silver maple is not adapted to Cubden, Divide, Lamoure, McIntosh, and Moritz soils because of the calcareous surface layer.

Table 9.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
ArA Arvilla	Slight	Slight	Slight	Slight.
Ba Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
BaB Barnes	Slight	Slight	Moderate: slope, small stones.	Slight.
BbB: Barnes	Slight	Slight	Moderate: slope, small stones.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
BbC: Barnes	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
BcD: Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Svea	Slight	Slight	Moderate: slope, small stones.	Slight.
BnA: Barnes	Slight	Slight	Moderate: small stones.	Slight.
Vienna	Slight	Slight	Slight	Slight.
BrA Brandt	Slight	Slight	Slight	Slight.
BrB Brandt	Slight	Slight	Moderate: slope.	Slight.
Bs Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
BtD: Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
BtD:				
Barnes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
BuC:				
Buse	Moderate: slope.	Moderate: slope.	Severe: large stones, slope.	Severe: large stones.
Barnes	Slight	Slight	Severe: large stones.	Slight.
BuE:				
Buse	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.
Barnes	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.
BvD:				
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
BxE:				
Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
ByC:				
Buse	Slight	Slight	Severe: slope.	Slight.
Poinsett	Slight	Slight	Severe: slope.	Slight.
ByD:				
Buse	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Poinsett	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Ca	Severe: flooding, wetness, too clayey.	Severe: wetness, too clayey.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
Castlewood				
Co:				
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Oldham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cu:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Cx:				
Cubden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Tonka	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dv Divide	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
EgB:				
Egeland	Slight	Slight	Moderate: slope.	Slight.
Embden	Slight	Slight	Moderate: slope.	Slight.
EmC:				
Egeland	Slight	Slight	Severe: slope.	Slight.
Maddock	Slight	Slight	Severe: slope.	Slight.
EsA Estelline	Slight	Slight	Slight	Slight.
EsB Estelline	Slight	Slight	Moderate: slope.	Slight.
Fa Fairdale	Severe: flooding.	Moderate: flooding.	Slight	Moderate: flooding.
FdA Fordville	Slight	Slight	Slight	Slight.
FoB:				
Fordville	Slight	Slight	Moderate: slope.	Slight.
Renshaw	Slight	Slight	Moderate: slope.	Slight.
HeA Hetland	Slight	Slight	Slight	Slight.
HeB Hetland	Slight	Slight	Moderate: slope.	Slight.
KrA:				
Kranzburg	Slight	Slight	Slight	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
KrB:				
Kranzburg	Slight	Slight	Moderate: slope.	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
La	Severe: flooding.	Slight	Moderate: flooding.	Slight.
La Prairie				
Ld	Severe: flooding.	Slight	Moderate: flooding.	Slight.
LaDelle				
Lm	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lamoure				
Lr:				
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Rauville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Lw	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lowe				
Ma	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Marysland				
MbA	Severe: wetness.	Moderate: wetness, excess salt.	Severe: wetness.	Moderate: wetness.
Mauvais				
Mc:				
McIntosh	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.
Badger	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Mn	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Minnewaukan				
Mz:				
Moritz	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Lamoure	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Oh	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Oldham				

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Or Orthents	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
Pa Parnell	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pm Playmoor	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.
PoB: Poinsett	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
PsB: Poinsett	Slight	Slight	Moderate: slope.	Slight.
Buse	Slight	Slight	Moderate: slope, small stones.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PsC: Poinsett	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
Waubay	Slight	Slight	Moderate: slope.	Slight.
PwA: Poinsett	Slight	Slight	Slight	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
PwB: Poinsett	Slight	Slight	Moderate: slope.	Slight.
Waubay	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Ra Rauville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
ReA Renshaw	Slight	Slight	Slight	Slight.
ReB Renshaw	Slight	Slight	Moderate: slope.	Slight.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
RnC:				
Renshaw	Slight	Slight	Severe: slope.	Slight.
Brandt	Slight	Slight	Moderate: slope.	Slight.
RsC:				
Renshaw	Slight	Slight	Severe: slope.	Slight.
Sioux	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
SaD:				
Sioux	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Renshaw	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
So	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Southam				
Sp	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Spottswood				
StB	Slight	Slight	Moderate: slope.	Slight.
Strayhoss				
To	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Tonka				
VbA:				
Vienna	Slight	Slight	Slight	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
VbB:				
Vienna	Slight	Slight	Moderate: slope.	Slight.
Brookings	Severe: wetness.	Slight	Moderate: wetness.	Slight.
VnC:				
Vienna	Slight	Slight	Severe: slope.	Slight.
Buse	Slight	Slight	Severe: slope.	Slight.
Wa	Severe: wetness.	Slight	Moderate: wetness.	Slight.
Waubay				

Table 10.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
ArA--Arvilla	Fair	Fair	Poor	Poor	Very poor.	Fair	Poor	Very poor.	Very poor.
Ba--Badger	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Fair.
BaB--Barnes	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BbB:									
Barnes	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Fair	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
BbC:									
Barnes	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
BcD:									
Barnes	Poor	Good	Good	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Svea	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
BnA:									
Barnes	Good	Good	Good	Good	Poor	Good	Poor	Very poor.	Very poor.
Vienna	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BrA, BrB--Brandt	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Bs--Brookings	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
BtD:									
Buse	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Barnes	Poor	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
BuC, BuE:									
Buse	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
BuC, BuE:									
Barnes	Very poor.	Very poor.	Fair	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.
BvD:									
Buse	Very poor.	Very poor.	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Very poor.
Lamoure	Very poor.	Poor	Fair	Good	Poor	Fair	Fair	Fair	Fair.
BxE:									
Buse	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Langhei	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
ByC:									
Buse	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Poinsett	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
ByD:									
Buse	Very poor.	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Poinsett	Very poor.	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Ca	Fair	Good	Poor	Good	Fair	Fair	Fair	Fair	Fair.
Castlewood									
Co:									
Colvin	Poor	Good	Fair	Very poor.	Poor	Poor	Fair	Fair	Fair.
Oldham	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Cu:									
Cubden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Badger	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Fair.
Cx:									
Cubden	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Tonka	Poor	Poor	Fair	Very poor.	Fair	Fair	Poor	Fair	Fair.
Dv	Fair	Fair	Fair	Good	Poor	Very poor.	Fair	Very poor.	Very poor.
Divide									
EgB:									
Egeland	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Embden	Fair	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
EmC:									
Egeland	Fair	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
Maddock	Poor	Fair	Good	Fair	Poor	Very poor.	Poor	Very poor.	Very poor.
EsA, EsB Estelline	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Fa Fairdale	Very poor.	Good	Fair	Good	Fair	Poor	Good	Poor	Poor.
FdA Fordville	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
FoB:									
Fordville	Good	Fair	Good	Poor	Poor	Poor	Poor	Very poor.	Very poor.
Renshaw	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.
HeA Hetland	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
HeB Hetland	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
KrA:									
Kranzburg	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
KrB:									
Kranzburg	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
La La Prairie	Good	Good	Good	Good	Fair	Poor	Good	Very poor.	Very poor.
Ld LaDelle	Good	Good	Good	Good	Fair	Poor	Good	Very poor.	Very poor.
Lm Lamoure	Good	Good	Fair	Good	Poor	Good	Fair	Fair	Fair.
Lr:									
Lamoure	Very poor.	Poor	Fair	Good	Fair	Poor	Fair	Fair	Fair.
Rauville	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Fair	Fair	Fair.
Lw Lowe	Fair	Good	Fair	Good	Fair	Poor	Fair	Fair	Fair.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Ma Marysland	Poor	Poor	Fair	Good	Poor	Poor	Fair	Good	Fair.
MbA Mauvais	Fair	Good	Fair	Very poor.	Poor	Poor	Fair	Fair	Fair.
Mc:									
McIntosh	Good	Good	Fair	Good	Fair	Poor	Fair	Poor	Poor.
Badger	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Fair.
Mn Minnewaukan	Poor	Good	Fair	Good	Poor	Very poor.	Fair	Fair	Fair.
Mz:									
Moritz	Good	Good	Fair	Good	Fair	Poor	Poor	Poor	Poor.
Lamoure	Poor	Poor	Fair	Good	Poor	Poor	Fair	Fair	Fair.
Oh Oldham	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Poor	Good	Good.
Or Orthents	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Pa Parnell	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Good	Good.
Pm Playmoor	Poor	Poor	Fair	Very poor.	Fair	Poor	Poor	Fair	Fair.
PoB:									
Poinsett	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Very poor.	Very poor.
PsB:									
Poinsett	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.
Waubay	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
PsC:									
Poinsett	Fair	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Buse	Fair	Fair	Fair	Poor	Very poor.	Fair	Poor	Very poor.	Very poor.
Waubay	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
PwA, PwB:									
Poinsett	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
PwA, PwB:									
Waubay	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
Ra	Very poor.	Poor	Poor	Very poor.	Poor	Very poor.	Fair	Fair	Fair.
Rauville									
ReA	Fair	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Renshaw									
ReB	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Renshaw									
RnC:									
Renshaw	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Brandt	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
RsC:									
Renshaw	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
SaD:									
Sioux	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Renshaw	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.
So	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good.
Southam									
Sp	Fair	Good	Good	Good	Poor	Poor	Poor	Very poor.	Very poor.
Spottswood									
StB	Good	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Strayhoss									
To	Poor	Poor	Fair	Very poor.	Fair	Fair	Poor	Fair	Fair.
Tonka									
VbA, VbB:									
Vienna	Good	Good	Good	Good	Fair	Very poor.	Poor	Very poor.	Very poor.
Brookings	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.
VnC:									
Vienna	Fair	Good	Good	Good	Poor	Very poor.	Poor	Very poor.	Very poor.
Buse	Poor	Fair	Fair	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements								
	Grain and seed crops	Grasses and legumes	Native herbaceous plants	Planted woody plants	Native deciduous trees	Native coniferous plants	Native shrubs	Wetland plants	Shallow water areas
Wa---------- Waubay	Good	Good	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.

Table 11.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
ArA Arvilla	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Ba Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
BaB Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
BbB, BbC: Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
BcD: Barnes	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Svea	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
BnA: Barnes	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
BrA Brandt	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
BrB Brandt	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Bs Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
BtD: Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Barnes	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
BuC: Buse	Moderate: large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Barnes	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength, frost action.
BuE: Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Barnes	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BvD: Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
BxE: Buse	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Langhei	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
ByC: Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
ByD:					
Buse	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.
Poinsett	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.
Ca	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Co:					
Colvin	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.
Oldham	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Cu:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Cx:					
Cubden	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Dv	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
EgB:					
Egeland	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Embden	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Moderate: frost action.
EmC:					
Egeland	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
EmC:					
Maddock	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
EsA	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.
EsB	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.
Fa	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
FdA	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
FoB:					
Fordville	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Renshaw	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
HeA, HeB	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.
KrA:					
Kranzburg	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
KrB:					
Kranzburg	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
La	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.
Ld	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.
Lm	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Lr:					
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Rauville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Lw--Lowe	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Ma--Marysland	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
MbA--Mauvais	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.
Mc:					
McIntosh	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.
Badger	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Mn--Minnewaukan	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.
Mz:					
Moritz	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.
Lamoure	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
Oh--Oldham	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.
Or--Orthents	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Pa--Parnell	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Pm Playmoor	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
PoB: Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
PsB: Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PsC: Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Waubay	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
PwA: Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
PwB: Poinsett	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
Waubay	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ra---------- Rauville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.
ReA---------- Renshaw	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
ReB---------- Renshaw	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
RnC:					
Renshaw----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
Brandt----------	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
RsC:					
Renshaw----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
Sioux----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
SaD:					
Sioux----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Renshaw----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
So---------- Southam	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
Sp---------- Spottswood	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
StB---------- Strayhoss	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight----------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.
To---------- Tonka	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.
VbA:					
Vienna----------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Brookings--------	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
VbB:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Brookings	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action, wetness.
VnC:					
Vienna	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Buse	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.
Wa	Moderate: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, wetness.
Waubay					

Table 12.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArA Arvilla	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ba Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
BaB Barnes	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BbB: Barnes	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BbC: Barnes	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
BcD: Barnes	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Svea	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
BnA: Barnes	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Vienna	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
BrA, BrB Brandt	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Bs Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
BtD: Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Barnes	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
BuC: Buse	Severe: percs slowly.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Fair: too clayey, large stones, slope.
Barnes	Severe: percs slowly.	Moderate: seepage, slope, large stones.	Moderate: too clayey.	Slight	Fair: too clayey, large stones.
BuE: Buse	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: slope.
Barnes	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BvD: Buse	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
BxE: Buse	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Langhei	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
ByC: Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Poinsett	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ByD:					
Buse	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Poinsett	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Ca	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Co:					
Colvin	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Oldham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Cu:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Badger	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Cx:					
Cubden	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack.
Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Dv	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
EgB:					
Egeland	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
Embden	Severe: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
EmC:					
Egeland	Slight	Severe: seepage, slope.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EmC:					
Maddock	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
EsA, EsB	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Fa	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
FdA	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FoB:					
Fordville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
HeA	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Poor: hard to pack.
HeB	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: hard to pack.
KrA:					
Kranzburg	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
KrB:					
Kranzburg	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
La	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Fair: too clayey.
Ld	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Poor: hard to pack.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Lm---------- Lamoure	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Lr:					
Lamoure----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Rauville----------	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Lw---------- Lowe	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ma---------- Marysland	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
MbA---------- Mauvais	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Mc:					
McIntosh----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Badger----------	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Mn---------- Minnewaukan	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
Mz:					
Moritz----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Lamoure----------	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
Oh---------- Oldham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Or---------- Orthents	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pa Parnell	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Pm Playmoor	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
PoB: Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
PsB: Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: wetness, seepage.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PsC: Poinsett	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
PwA: Poinsett	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: wetness, seepage.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
PwB: Poinsett	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Waubay	Severe: wetness, percs slowly.	Moderate: wetness, seepage.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ra Rauville	Severe: flooding, wetness, percs slowly.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
ReA, ReB Renshaw	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
RnC: Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Brandt	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
RsC: Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
SaD: Sioux	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Renshaw	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
So Southam	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Sp Spottswood	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, small stones.
StB Strayhoss	Severe: poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
To Tonka	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VbA:					
Vienna	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VbB:					
Vienna	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Brookings	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
VnC:					
Vienna	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Buse	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Wa	Severe: wetness, percs slowly.	Moderate: wetness, seepage.	Severe: wetness, too clayey.	Severe: wetness.	Fair: too clayey, wetness.
Waubay					

Table 13.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ArA Arvilla	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Ba Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
BaB Barnes	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BbB, BbC:				
Barnes	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
BcD:				
Barnes	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Svea	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BnA:				
Barnes	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
BrA, BrB Brandt	Good	Probable	Probable	Poor: area reclaim.
Bs Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BtD:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BtD:				
Barnes	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
BuC:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Barnes	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
BuE:				
Buse	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Barnes	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
BvD:				
Buse	Fair: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BxE:				
Buse	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Langhei	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
ByC:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ByD:				
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ca Castlewood	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Co: Colvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Oldham	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Cu: Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Cx: Cubden	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Dv Divide	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
EgB: Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
Embden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
EmC: Egeland	Good	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones.
Maddock	Good	Probable	Improbable: too sandy.	Poor: too sandy.
EsA, EsB Estelline	Good	Probable	Probable	Poor: area reclaim.
Fa Fairdale	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
FdA Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FoB:				
Fordville	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
HeA, HeB	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Hetland				
KrA, KrB:				
Kranzburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
La	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
La Prairie				
Ld	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
LaDelle				
Lm	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lamoure				
Lr:				
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rauville	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lowe				
Ma	Poor: wetness.	Probable	Probable	Poor: wetness.
Marysland				
MbA	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, excess salt.
Mauvais				
Mc:				
McIntosh	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Badger	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Mn	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones, wetness.
Minnewaukan				

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mz:				
Moritz	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Lamoure	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Oh	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Oldham				
Or	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Orthents				
Pa	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Parnell				
Pm	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
Playmoor				
PoB:				
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
PsB, PsC:				
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PwA, PwB:				
Poinsett	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ra	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Rauville				
ReA, ReB	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw				

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
RnC:				
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Brandt	Good	Probable	Probable	Poor: area reclaim.
RsC:				
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
SaD:				
Sioux	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
Renshaw	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
So Southam	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Sp Spottswood	Fair: wetness.	Probable	Probable	Poor: too sandy, small stones, area reclaim.
StB Strayhoss	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: thin layer.
To Tonka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
VbA, VbB:				
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Brookings	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
VnC:				
Vienna	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Buse	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wa---------- Waubay	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

Table 14.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
ArA Arvilla	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Ba Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
BaB Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BbB, BbC:						
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BcD:						
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Svea	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BnA:						
Barnes	Slight	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Vienna	Slight	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
BrA Brandt	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
BrB Brandt	Severe: seepage.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Bs Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
BtD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
BuC:						
Buse	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BuC:						
Barnes	Moderate: slope.	Severe: piping.	Deep to water	Slope	Large stones, erodes easily.	Large stones, erodes easily.
BuE:						
Buse	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, excess salt.	Slope, large stones.	Large stones, slope.
Barnes	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
BvD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
BxE:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Langhei	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
ByC:						
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
ByD:						
Buse	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Poinsett	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Ca	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Castlewood						
Co:						
Colvin	Moderate: seepage.	Severe: wetness.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Oldham	Slight	Severe: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cu:						
Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Cu:						
Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Cx:						
Cubden	Moderate: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Tonka	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Dv	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
EgB:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Embden	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
EmC:						
Egeland	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty.	Too sandy, soil blowing.	Droughty.
Maddock	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
EsA	Severe: seepage.	Severe: seepage.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.
EsB	Severe: seepage.	Severe: seepage.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
Fa	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
FdA	Severe: seepage.	Severe: seepage.	Deep to water	Rooting depth	Too sandy	Rooting depth.
FoB:						
Fordville	Severe: seepage.	Severe: seepage.	Deep to water	Slope, rooting depth.	Too sandy	Rooting depth.
Renshaw	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
HeA	Slight	Moderate: piping, hard to pack.	Deep to water	Percs slowly	Erodes easily, percs slowly.	Erodes easily, percs slowly.
HeB	Moderate: slope.	Moderate: piping, hard to pack.	Deep to water	Slope, percs slowly.	Erodes easily, percs slowly.	Erodes easily, percs slowly.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
KrA:						
Kranzburg	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
KrB:						
Kranzburg	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
La La Prairie	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Ld LaDelle	Moderate: seepage.	Severe: hard to pack.	Deep to water	Flooding	Favorable	Favorable.
Lm Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Lr:						
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Rauville	Severe: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
Lw Lowe	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
Ma Marysland	Severe: seepage.	Severe: seepage, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Wetness.
MbA Mauvais	Slight	Severe: piping, wetness.	Frost action	Wetness	Wetness	Wetness, excess salt.
Mc:						
McIntosh	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
Badger	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Mn Minnewaukan	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, cutbanks cave.	Ponding, droughty, fast intake.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Mz:						
Moritz	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Mz:						
Lamoure	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Oh	Slight	Severe: hard to pack, ponding.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Or	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty, rooting depth.
Pa	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Pm	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action, cutbanks cave.	Wetness, flooding, excess salt.	Wetness, too sandy.	Wetness, excess salt.
PoB:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
PsB:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
PsC:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
PwA:						
Poinsett	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
PwB:						
Poinsett	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.
Ra	Severe: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
Rauville						
ReA	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Too sandy	Droughty.
Renshaw						
ReB	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Renshaw						
RnC:						
Renshaw	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Brandt	Severe: seepage.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
RsC:						
Renshaw	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
Sioux	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty.	Too sandy	Droughty.
SaD:						
Sioux	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
Renshaw	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty.	Slope, too sandy.	Slope, droughty.
So	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess salt, erodes easily.
Southam						
Sp	Severe: seepage.	Severe: seepage, wetness.	Flooding, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
Spottswood						
StB	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope	Erodes easily, too sandy.	Erodes easily.
Strayhoss						
To	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Tonka						
VbA:						
Vienna	Slight	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
VbA:						
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
VbB:						
Vienna	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Brookings	Moderate: seepage.	Slight	Deep to water	Excess salt	Erodes easily	Erodes easily.
VnC:						
Vienna	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Buse	Moderate: slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Wa Waubay	Moderate: seepage.	Moderate: piping, wetness.	Deep to water	Favorable	Erodes easily	Erodes easily.

Table 15.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ArA Arvilla	0-12	Sandy loam	SM, SC, SC-SM	A-2, A-4, A-6	0	95-100	90-100	50-80	20-45	15-30	NP-15
	12-22	Sandy loam, loam, coarse sandy loam.	SM, SC, SC-SM	A-2, A-4, A-6	0	90-100	85-100	50-80	20-45	15-40	NP-15
	22-60	Gravelly coarse sand, very gravelly coarse sand, loamy sand.	SP-SM, GP, SM, GP-GM	A-1, A-2, A-3	0	35-100	25-100	10-60	0-15	---	NP
Ba Badger	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	8-36	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	36-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
BaB Barnes	0-8	Clay loam	CL, CL-ML	A-6, A-4	0-5	90-100	85-100	85-100	70-80	25-40	5-20
	8-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	22-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
BbB, BbC:											
Barnes	0-8	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-90	20-40	5-20
	8-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	22-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
BcD:											
Barnes	0-8	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-90	20-40	5-20
	8-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	22-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Svea	0-17	Loam	CL, CL-ML	A-4, A-6	0-5	95-100	85-100	80-95	60-90	20-38	5-20
	17-31	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-90	20-45	5-25
	31-60	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	95-100	85-100	80-95	60-85	20-50	5-30
BnA:											
Barnes	0-8	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-90	20-40	5-20
	8-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	22-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
BnA:											
Vienna	0-7	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	7-16	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	16-44	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	44-60	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
BrA, BrB	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
Brandt	8-32	Silty clay loam, silt loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-100	35-50	8-23
	32-42	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	85-100	60-100	30-40	5-15
	42-49	Gravelly loam, gravelly sandy loam, very gravelly loam.	SM, GM, GC, SC	A-2, A-4, A-1, A-6	0-5	50-80	30-70	20-60	15-50	30-40	5-15
	49-60	Stratified sandy loam to very gravelly sand.	SM, GM, GM-GC, GP-GM	A-1, A-2	0-5	50-80	30-70	20-50	5-35	15-25	NP-5
Bs	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
Brookings	17-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	32-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
BtD:											
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Barnes	0-8	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	60-90	20-40	5-20
	8-22	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	22-36	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
	36-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	75-95	55-80	25-40	5-20
BuC, BuE:											
Buse	0-7	Loam	ML, CL	A-4, A-6	0-70	90-100	85-95	70-90	55-80	30-40	5-15
	7-24	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
	24-60	Loam, clay loam, very stony loam.	CL	A-4, A-6	0-30	90-100	85-95	70-90	60-80	25-40	8-15
Barnes	0-8	Loam	CL	A-6	3-25	90-100	85-100	80-100	60-75	25-40	10-20
	8-22	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-20	90-100	85-100	75-95	60-80	25-40	5-20
	22-60	Loam, clay loam, stony loam.	CL, CL-ML	A-4, A-6	0-15	90-100	85-100	75-95	60-80	25-40	5-20
BvD:											
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BvD:											
Lamoure	0-35	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	35-60	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
BxE:											
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Langhei	0-4	Clay loam	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	4-15	Clay loam, silty clay.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
	15-60	Clay loam, silty clay loam.	CL, ML	A-7, A-6	0	95-100	90-100	75-95	70-80	35-45	10-20
ByC, ByD:											
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Poinsett	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	9-18	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	18-25	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	25-60	Clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Ca	0-18	Silty clay	CH, MH	A-7	0	100	100	100	90-100	50-75	25-40
Castlewood	18-46	Clay loam, silty clay, clay.	CL, CH, MH, ML	A-7	0	100	100	90-100	90-100	45-75	20-40
	46-58	Stratified sandy loam to silty clay loam.	CL, CH, MH, ML	A-4, A-6	0	100	100	80-100	55-90	20-40	NP-20
	58-60	Gravelly loamy coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-90	35-70	5-20	---	NP
Co:											
Colvin	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	7-35	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	25-50	10-30
	35-60	Loam, silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	25-50	10-25
Oldham	0-9	Silty clay loam	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	40-60	15-25
	9-44	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	85-100	40-60	15-25
	44-60	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	70-100	25-45	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
Cu:											
Cubden	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	9-40	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	40-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
Badger	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	8-36	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	36-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Cx:											
Cubden	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	80-100	35-50	10-25
	9-40	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	25-55	10-30
	40-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-100	20-55	10-30
Tonka	0-18	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	30-45	10-25
	18-45	Silty clay loam, clay loam, clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	45-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
Dv	0-9	Loam	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-95	60-85	25-40	5-20
Divide	9-30	Loam, clay loam, gravelly loam.	CL, CL-ML, SC-SM, SC	A-4, A-6, A-7	0-3	95-100	75-100	55-90	35-80	20-45	5-20
	30-60	Stratified sand to gravelly sand.	GM, SM, GP-GM, SP-SM	A-1, A-3	0-5	25-100	15-100	10-70	5-25	0-30	NP-5
EgB:											
Egeland	0-10	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	10-25	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	25-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Embden	0-13	Fine sandy loam	SM, ML	A-2, A-4	0	100	100	60-95	30-65	15-35	NP-10
	13-45	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	45-60	Fine sandy loam, sandy loam, loamy fine sand.	SM	A-2, A-4	0	100	100	50-80	15-50	---	NP
EmC:											
Egeland	0-10	Sandy loam	SM, SC-SM	A-2, A-4	0	100	95-100	75-100	30-50	15-25	NP-7
	10-25	Sandy loam, fine sandy loam.	SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	15-50	15-25	NP-7
	25-60	Loamy sand, loamy fine sand, loamy very fine sand.	SM, SP-SM, SC-SM	A-2, A-4	0	95-100	85-100	70-100	10-45	15-25	NP-5
Maddock	0-9	Sandy loam	SM	A-2, A-4	0	100	100	60-85	30-50	---	NP
	9-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-100	5-35	---	NP

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
EsA, EsB---------	0-9	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	80-100	30-45	5-20
Estelline	9-33	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	11-25
	33-36	Silt loam, loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	80-100	70-100	30-40	5-15
	36-60	Gravelly sandy loam, gravelly loamy sand, sand.	SM, SW-SM, SP-SM	A-1	0-5	70-100	50-85	10-50	5-25	15-25	NP-5
Fa---------------	0-8	Loam------------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-40	3-15
Fairdale	8-60	Stratified very fine sandy loam to silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	55-90	20-40	NP-20
FdA---------------	0-11	Loam------------	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
Fordville	11-24	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	24-30	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	30-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
FoB:											
Fordville-------	0-11	Loam------------	ML, CL	A-4, A-6, A-7	0	100	100	70-85	55-75	30-45	5-20
	11-24	Loam, silt loam, clay loam.	CL, ML	A-4, A-6, A-7	0	100	95-100	70-95	55-80	30-45	5-20
	24-30	Loam, clay loam, fine sandy loam.	CL, ML, SM, SC	A-4, A-6	0	95-100	90-100	65-90	40-55	25-40	3-15
	30-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0	65-85	45-70	15-45	0-15	15-25	NP-5
Renshaw---------	0-11	Loam------------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	11-17	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	17-60	Gravelly loamy sand, very gravelly loamy sand, gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
HeA, HeB---------	0-10	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	45-60	20-35
Hetland	10-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	20-35
	21-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	15-30
	39-60	Stratified very fine sandy loam to silty clay loam.	CL, CH	A-6, A-7	0	100	95-100	95-100	85-100	35-55	11-30

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KrA, KrB:											
Kranzburg	0-8	Silty clay loam	CL, CH	A-7	0	100	100	95-100	90-100	40-55	15-30
	8-14	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	14-26	Silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	26-44	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
	44-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Brookings	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	17-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	32-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
La	0-17	Loam	CL-ML, CL	A-4, A-6	0	100	100	85-95	70-80	25-40	5-15
La Prairie	17-45	Silt loam, loam, silty clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	50-90	25-50	5-25
	45-55	Silt loam, loam, clay loam.	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	70-90	25-50	5-25
	55-60	Stratified fine sandy loam to silty clay loam.	CL-ML, CL, SC, SC-SM	A-4, A-6, A-7	0	100	95-100	75-100	45-90	25-50	5-25
Ld	0-20	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	90-100	80-100	30-45	7-20
LaDelle	20-32	Silt loam, silty clay loam, loam.	CL, ML, MH, CH	A-6, A-7	0	100	100	90-100	75-100	30-55	10-25
	32-60	Stratified silt loam to clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	90-100	75-100	25-60	5-30
Lm	0-35	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	45-70	20-35
Lamoure	35-60	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	85-100	40-70	15-35
Lr:											
Lamoure	0-35	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	35-60	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
Rauville	0-9	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
	9-60	Silty clay loam, silt loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
Lw	0-7	Loam	ML, CL	A-4, A-6, A-7	0	100	100	90-100	60-75	30-45	5-20
Lowe	7-29	Clay loam, loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-85	35-50	11-25
	29-60	Stratified silty clay loam to loamy sand.	ML, CL, SM, SC	A-4, A-6, A-7	0	100	100	85-100	45-75	30-45	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ma	0-14	Loam	CL	A-6, A-7	0	95-100	95-100	85-95	50-80	30-50	10-25
Marysland	14-38	Loam, clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	80-95	45-80	20-40	10-20
	38-60	Stratified fine sand to very gravelly coarse sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	35-90	35-70	5-20	---	NP
MbA	0-5	Clay loam	CL, CL-ML	A-6, A-4	0-5	90-100	85-100	85-100	60-90	25-40	5-20
Mauvais	5-60	Loam, clay loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	75-95	55-80	25-45	5-25
Mc:											
McIntosh	0-9	Silty clay loam	CL, ML	A-4, A-6	0	100	100	85-95	60-80	20-40	3-25
	9-29	Silt loam, silty clay loam, loam.	ML, CL	A-4, A-6	0	100	100	90-100	70-90	28-43	9-21
	29-60	Loam, clay loam	CL, ML	A-6, A-4	0-5	95-100	90-100	80-95	60-80	28-43	9-21
Badger	0-8	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	10-25
	8-36	Silty clay, clay, silty clay loam.	CH, ML, CL, MH	A-7	0	100	100	90-100	75-95	45-65	15-35
	36-60	Silty clay loam, silt loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Mn	0-5	Loamy sand	SM	A-2	0	90-100	70-100	50-85	15-30	0-20	NP-10
Minnewaukan	5-60	Sand, loamy sand, fine sand.	SM, SP-SM	A-2, A-3	0	90-100	70-100	60-100	5-35	0-20	NP-10
Mz:											
Moritz	0-9	Loam	CL	A-6	0	100	100	85-100	60-75	30-40	10-20
	9-54	Loam, clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	60-80	35-50	11-25
	54-60	Stratified silty clay loam to loamy sand.	CL, ML, SC-SM	A-4, A-6, A-7	0	100	100	85-95	45-75	20-45	3-20
Lamoure	0-35	Silty clay loam	CL, CH, MH, ML	A-7	0	100	100	95-100	85-100	40-70	15-35
	35-60	Silty clay loam, silt loam.	CL, CH, MH, ML	A-7	0	100	100	90-100	60-100	40-70	15-35
Oh	0-9	Silty clay loam	CL, CH, MH, ML	A-7	0	100	95-100	90-100	85-100	40-60	15-25
Oldham	9-44	Silty clay loam, clay loam, silty clay.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	85-100	40-60	15-25
	44-60	Silty clay loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	70-100	25-45	5-20
Or	0-10	Gravelly loam	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
Orthents	10-60	Gravelly loamy sand, gravelly sand, very gravelly sand.	SW, SW-SM, SM	A-1	0-10	60-85	45-70	15-45	0-15	15-25	NP-5

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pa	0-18	Silty clay loam	CL, CH	A-7	0	100	100	95-100	85-100	40-60	15-30
Parnell	18-38	Clay loam, silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	90-100	70-100	40-80	20-50
	38-60	Clay loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-95	70-95	30-80	15-50
Pm	0-8	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	80-100	35-60	12-25
Playmoor	8-30	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	80-100	35-60	12-25
	30-44	Silt loam, silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	95-100	85-100	35-60	12-25
	44-60	Stratified loamy sand to silty clay loam.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	70-100	35-60	12-25
PoB:											
Poinsett	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	9-18	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	18-25	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	25-60	Clay loam, silt loam, loam.	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
PsB, PsC:											
Poinsett	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	9-18	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	18-25	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	25-60	Clay loam, silt loam, loam.	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PsB, PsC:											
Waubay	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-29	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	29-48	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	48-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
PwA, PwB:											
Poinsett	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	9-18	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	18-25	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0	100	95-100	95-100	75-100	30-50	10-25
	25-60	Clay loam, silt loam, loam.	CL	A-6, A-7	0	95-100	90-100	80-100	65-85	30-50	10-30
Waubay	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	14-29	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	29-48	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	48-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20
Ra	0-9	Silty clay loam	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
Rauville	9-60	Silty clay loam, silt loam, silty clay.	CL, CH, MH, ML	A-6, A-7	0	100	100	90-100	85-100	35-60	15-28
ReA, ReB	0-11	Loam	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
Renshaw	11-17	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	17-60	Gravelly loamy sand, very gravelly loamy sand, very gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
RnC:											
Renshaw	0-11	Loam	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	11-17	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	17-60	Gravelly loamy sand, very gravelly loamy sand, very gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO	3-10 inches	4	10	40	200		
	In				Pct					Pct	
RnC:											
Brandt----------	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	11-25
	8-32	Silty clay loam, silt loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-100	35-50	8-23
	32-42	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	85-100	60-100	30-40	5-15
	42-49	Gravelly loam, gravelly sandy loam, very gravelly loam.	SM, GM, GC, SC	A-2, A-4, A-1, A-6	0-5	50-80	30-70	20-60	15-50	30-40	5-15
	49-60	Stratified sand to very gravelly loam.	SM, GM, GM-GC, GP-GM	A-1, A-2	0-5	50-80	30-70	20-50	5-35	15-25	NP-5
RsC:											
Renshaw---------	0-11	Loam----------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	11-17	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	17-60	Gravelly loamy sand, very gravelly loamy sand, very gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
Sioux----------	0-7	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-14	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	14-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0	25-75	20-60	5-35	0-25	0-25	NP-5
SaD:											
Sioux----------	0-7	Gravelly loam----	SM, GM	A-4, A-2	0-5	60-90	50-80	45-70	25-50	20-35	NP-7
	7-14	Gravelly loam, gravelly sandy loam, gravelly loamy sand.	SM, GM	A-4, A-2, A-1	0-5	60-90	50-80	45-70	15-50	20-35	NP-7
	14-60	Extremely gravelly sand, very gravelly loamy sand, very gravelly sand.	GM, GP, SM, SP	A-1	0	25-75	20-60	5-35	0-25	0-25	NP-5
Renshaw---------	0-11	Loam----------	ML, CL	A-4, A-6	0-5	95-100	90-100	70-100	50-75	30-40	5-15
	11-17	Loam, sandy clay loam, gravelly loam.	SC-SM, SC, ML, CL	A-4, A-6	0-5	95-100	55-100	45-90	35-70	20-40	3-15
	17-60	Gravelly loamy sand, very gravelly loamy sand, very gravelly sand.	SW, SM, SW-SM, GW-GM	A-1, A-2	0-5	45-95	30-80	10-60	0-15	0-25	NP-5
So----------	0-6	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-50	10-25
Southam	6-42	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	90-100	85-100	40-75	15-50
	42-60	Silty clay, silty clay loam, loam.	CL, CH, CL-ML	A-6, A-7, A-4	0	100	95-100	85-100	60-100	20-75	5-50

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sp	0-8	Loam	CL, CL-ML	A-6, A-4	0	95-100	95-100	90-100	65-90	25-40	5-15
Spottswood	8-26	Clay loam, loam	CL	A-6, A-7	0	95-100	95-100	85-100	55-80	30-45	10-20
	26-60	Gravelly sand, loamy sand, gravelly loamy sand.	SM, GM, SP-SM, GP-GM	A-1, A-2	0-5	40-80	25-75	15-70	10-30	15-20	NP-4
StB	0-7	Loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	30-45	5-20
Strayhoss	7-30	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	100	95-100	85-100	30-50	5-25
	30-36	Silty clay loam, silt loam, loam.	CL, ML	A-6, A-7, A-4	0	100	100	90-100	85-100	30-50	5-25
	36-60	Loamy sand, loamy fine sand, fine sand.	SP-SM, SM, SC-SM	A-2, A-3	0	100	100	50-85	5-30	15-30	NP-10
To	0-18	Silty clay loam, silt loam.	CL	A-6, A-7	0-2	100	95-100	90-100	70-90	25-45	5-25
Tonka	18-45	Silty clay loam, silty clay, clay.	CH, CL	A-6, A-7	0-2	100	95-100	90-100	75-95	35-55	15-35
	45-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0-3	90-100	85-100	60-100	50-90	25-50	5-30
VbA, VbB:											
Vienna	0-7	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	7-16	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	16-44	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	44-60	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Brookings	0-17	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	17-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-25
	25-32	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-25
	32-60	Loam, clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-85	35-50	15-25
VnC:											
Vienna	0-7	Silt loam	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	7-16	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	90-100	85-100	35-50	10-25
	16-44	Clay loam, loam	CL	A-6, A-7	0-5	95-100	90-100	85-100	60-85	30-45	10-20
	44-60	Clay loam, loam	CL	A-6	0-5	90-100	85-100	80-100	55-80	30-40	10-20
Buse	0-7	Loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	70-95	55-90	20-35	3-15
	7-24	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
	24-60	Loam, clay loam	CL, CL-ML, ML	A-4, A-6, A-7	0	90-100	85-100	70-90	55-85	25-45	5-20
Wa	0-14	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
Waubay	14-29	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-100	35-50	10-25
	29-48	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	5-20
	48-60	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	100	90-100	70-95	30-45	5-20

Table 16.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
ArA	0-12	6-18	1.40-1.60	2.0-6.0	0.13-0.15	6.1-8.4	0-0	Low	0.20	3	3	1-4
Arvilla	12-22	6-18	1.40-1.60	2.0-6.0	0.11-0.14	6.6-8.4	0-0	Low	0.20			
	22-60	2-10	1.40-1.60	>20	0.02-0.05	7.4-8.4	0-0	Low	0.10			
Ba	0-8	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
Badger	8-36	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High	0.28			
	36-60	20-35	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
BaB	0-8	27-35	1.20-1.60	0.2-0.6	0.17-0.19	5.6-7.8	0-2	Low	0.24	5	6	3-7
Barnes	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	22-36	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	36-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
BbB, BbC:												
Barnes	0-8	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low	0.28	5	6	3-7
	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	22-36	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	36-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
BcD:												
Barnes	0-8	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low	0.24	5	6	3-7
	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	22-36	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	36-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Svea	0-17	18-26	1.10-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-0	Low	0.24	5	6	5-8
	17-31	18-28	1.20-1.50	0.6-2.0	0.17-0.22	6.6-7.8	0-0	Moderate	0.28			
	31-60	18-28	1.20-1.50	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
BnA:												
Barnes	0-8	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low	0.24	5	6	3-7
	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	22-36	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	36-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Vienna	0-7	22-26	1.10-1.25	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low	0.28	5	6	3-8
	7-16	24-32	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	16-44	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	44-60	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
BrA, BrB	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	4	7	4-8
Brandt	8-32	25-35	1.20-1.35	0.6-2.0	0.17-0.21	6.1-7.8	0-2	Moderate	0.32			
	32-42	20-30	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-49	20-27	1.45-1.60	2.0-6.0	0.06-0.08	7.4-8.4	0-2	Low	0.24			
	49-60	5-10	1.60-1.75	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
Bs	0-17	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Moderate	0.28	5	7	4-8
Brookings	17-25	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	25-32	27-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32			
	32-60	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
BtD:												
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Barnes	0-8	10-25	1.20-1.60	0.6-2.0	0.13-0.24	5.6-7.8	0-2	Low	0.28	5	6	3-7
	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Moderate	0.28			
	22-36	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
	36-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
BuC, BuE:												
Buse	0-7	20-27	1.40-1.50	0.6-2.0	0.18-0.20	6.6-8.4	0-2	Moderate	0.20	5	8	2-4
	7-24	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
	24-60	20-30	1.55-1.65	0.2-0.6	0.16-0.20	7.4-8.4	2-8	Moderate	0.28			
Barnes	0-8	18-26	1.20-1.60	0.6-2.0	0.20-0.22	5.6-7.8	0-2	Low	0.17	5	8	3-7
	8-22	18-35	1.20-1.60	0.6-2.0	0.15-0.19	6.1-7.8	0-4	Low	0.28			
	22-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Low	0.37			
BvD:												
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Lamoure	0-35	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	35-60	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
BxE:												
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Langhei	0-4	28-35	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	.5-3
	4-15	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Low	0.32			
	15-60	28-35	1.50-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Low	0.32			
ByC, ByD:												
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Poinsett	0-9	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	9-18	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	18-25	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	25-60	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Ca	0-18	40-50	1.15-1.25	0.06-0.2	0.13-0.18	5.6-7.3	0-2	High	0.28	5	4	4-6
Castlewood	18-46	35-50	1.20-1.40	0.06-0.2	0.16-0.18	6.6-7.8	2-4	High	0.28			
	46-58	35-50	1.20-1.40	0.06-0.2	0.16-0.18	6.6-7.8	2-4	High	0.28			
	58-60	35-50	1.25-1.45	0.06-0.2	0.16-0.18	7.4-8.4	2-4	High	0.43			
Co:												
Colvin	0-7	27-34	1.20-1.50	0.2-0.6	0.20-0.22	6.6-8.4	0-0	Moderate	0.37	5	4L	4-10
	7-35	18-34	1.30-1.50	0.2-0.6	0.16-0.20	7.4-8.4	0-0	Moderate	0.37			
	35-60	18-34	1.30-1.40	0.2-0.6	0.15-0.20	7.4-8.4	0-0	Moderate	0.43			
Oldham	0-9	35-40	1.15-1.30	0.2-0.6	0.13-0.19	6.6-7.8	0-4	High	0.37	5	4	4-7
	9-44	35-45	1.25-1.40	0.06-0.2	0.14-0.20	7.4-8.4	0-4	High	0.37			
	44-60	20-40	1.30-1.50	0.06-0.2	0.14-0.20	7.4-8.4	0-2	Moderate	0.43			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm		K	T		Pct
Cu:												
Cubden	0-9	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	9-40	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	40-60	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
Badger	0-8	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	8-36	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High	0.28			
	36-60	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Cx:												
Cubden	0-9	27-34	1.15-1.30	0.6-2.0	0.19-0.22	6.6-8.4	0-4	Moderate	0.28	5	4L	1-6
	9-40	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	40-60	18-34	1.30-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.43			
Tonka	0-18	18-39	1.00-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Moderate	0.37	5	7	5-10
	18-45	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High	0.43			
	45-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
Dv	0-9	15-27	1.10-1.40	0.6-2.0	0.18-0.22	7.4-8.4	0-0	Low	0.24	5	4L	4-8
Divide	9-30	18-30	1.20-1.50	0.6-2.0	0.16-0.19	7.4-8.4	0-0	Low	0.28			
	30-60	0-10	1.30-1.70	>20	0.03-0.07	7.4-8.4	0-0	Low	0.10			
EgB:												
Egeland	0-10	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low	0.20	5	3	1-3
	10-25	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low	0.20			
	25-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low	0.17			
Embden	0-13	10-18	1.40-1.60	2.0-6.0	0.13-0.18	6.1-7.3	0-0	Low	0.20	5	3	4-7
	13-45	10-18	1.40-1.60	2.0-6.0	0.12-0.17	6.6-7.8	0-0	Low	0.20			
	45-60	5-18	1.40-1.60	2.0-6.0	0.06-0.16	7.4-8.4	0-0	Low	0.24			
EmC:												
Egeland	0-10	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	0-2	Low	0.20	5	3	1-3
	10-25	10-18	1.30-1.45	2.0-6.0	0.09-0.15	6.1-7.8	0-2	Low	0.20			
	25-60	5-10	1.40-1.65	2.0-6.0	0.08-0.10	6.6-8.4	0-2	Low	0.17			
Maddock	0-9	5-15	1.35-1.45	6.0-20	0.13-0.18	6.6-7.8	0-0	Low	0.20	5	3	1-3
	9-60	3-9	1.35-1.45	6.0-20	0.05-0.13	6.6-8.4	0-0	Low	0.17			
EsA, EsB	0-9	20-27	1.10-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Low	0.28	4	6	4-8
Estelline	9-33	22-30	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	33-36	20-30	1.25-1.40	0.6-2.0	0.16-0.20	7.4-8.4	0-2	Low	0.43			
	36-60	0-5	1.50-1.70	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
Fa	0-8	18-27	1.20-1.40	0.6-2.0	0.20-0.24	7.4-7.8	0-0	Low	0.24	5	4L	3-7
Fairdale	8-60	18-35	1.20-1.50	0.6-2.0	0.17-0.23	7.4-8.4	0-2	Moderate	0.32			
FdA	0-11	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low	0.24	4	6	3-7
Fordville	11-24	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	24-30	15-30	1.25-1.45	0.6-6.0	0.12-0.18	6.1-8.4	0-2	Low	0.28			
	30-60	0-5	1.60-1.80	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
FoB:												
Fordville	0-11	18-25	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	0-2	Low	0.24	4	6	3-7
	11-24	18-30	1.25-1.40	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.28			
	24-30	15-30	1.25-1.45	0.6-6.0	0.12-0.18	6.1-8.4	0-2	Low	0.28			
	30-60	0-5	1.60-1.80	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
Renshaw	0-11	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low	0.28	3	6	2-4
	11-17	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low	0.28			
	17-60	0-5	1.45-1.65	6.0-60	0.03-0.06	6.6-8.4	0-2	Low	0.10			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
HeA, HeB	0-10	35-45	1.20-1.30	0.06-0.2	0.13-0.19	5.6-7.3	0-2	High	0.37	5	4	4-7
Hetland	10-21	35-50	1.20-1.40	0.06-0.2	0.11-0.19	5.6-7.3	0-2	High	0.37			
	21-39	35-50	1.30-1.40	0.06-0.2	0.11-0.20	7.4-8.4	0-2	High	0.37			
	39-60	25-40	1.25-1.45	0.06-0.6	0.11-0.20	6.6-8.4	0-4	High	0.37			
KrA, KrB:												
Kranzburg	0-8	27-34	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-8
	8-14	24-34	1.20-1.35	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	14-26	24-34	1.20-1.35	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.32			
	26-44	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-4	Moderate	0.37			
	44-60	25-30	1.50-1.70	0.2-0.6	0.16-0.20	7.4-9.0	0-8	Moderate	0.37			
Brookings	0-17	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-2	Moderate	0.28	5	7	4-8
	17-25	27-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-2	Moderate	0.32			
	25-32	27-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.32			
	32-60	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
La	0-17	18-27	1.10-1.40	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Low	0.24	5	6	2-6
La Prairie	17-45	18-35	1.10-1.50	0.6-2.0	0.17-0.22	6.6-8.4	0-0	Moderate	0.32			
	45-55	18-35	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.32			
	55-60	18-30	1.30-1.70	0.6-2.0	0.15-0.22	6.6-8.4	0-0	Moderate	0.28			
Ld	0-20	20-27	1.15-1.30	0.6-2.0	0.20-0.22	6.1-7.8	0-2	Low	0.28	5	6	3-7
LaDelle	20-32	25-35	1.20-1.35	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Moderate	0.32			
	32-60	25-50	1.30-1.40	0.6-2.0	0.12-0.22	7.4-8.4	0-4	Moderate	0.28			
Lm	0-35	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
Lamoure	35-60	25-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
Lr:												
Lamoure	0-35	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	35-60	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
Rauville	0-9	27-35	1.10-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-2	Moderate	0.28	5	4L	4-7
	9-60	20-45	1.10-1.30	0.2-2.0	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
Lw	0-7	24-27	1.20-1.30	0.6-2.0	0.17-0.20	6.6-8.4	0-2	Low	0.24	5	4L	5-8
Lowe	7-29	24-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-8.4	0-2	Moderate	0.28			
	29-60	10-30	1.35-1.50	0.6-2.0	0.13-0.19	7.4-8.4	0-4	Moderate	0.28			
Ma	0-14	18-30	1.20-1.30	0.6-2.0	0.17-0.22	7.9-8.4	0-2	Moderate	0.24	4	4L	1-6
Marysland	14-38	18-30	1.35-1.50	0.6-2.0	0.15-0.19	7.9-8.4	0-2	Moderate	0.43			
	38-60	1-5	1.55-1.65	>20	0.02-0.07	7.9-8.4	0-2	Low	0.10			
MbA	0-5	27-35	1.20-1.60	0.2-0.6	0.14-0.20	6.6-8.4	0-8	Moderate	0.24	5	4L	3-7
Mauvais	5-60	18-35	1.30-1.60	0.2-0.6	0.12-0.16	7.4-8.4	2-8	Moderate	0.24			
Mc:												
McIntosh	0-9	18-27	1.35-1.50	0.6-2.0	0.18-0.22	7.4-8.4	0-4	Low	0.24	5	4L	4-7
	9-29	18-35	1.40-1.50	0.6-2.0	0.16-0.22	7.4-8.4	0-4	Moderate	0.43			
	29-60	18-35	1.30-1.60	0.2-0.6	0.14-0.19	7.4-8.4	0-4	Moderate	0.37			
Badger	0-8	27-35	1.15-1.25	0.2-0.6	0.19-0.22	6.1-7.3	0-2	Moderate	0.37	5	7	4-8
	8-36	35-50	1.25-1.40	0.06-0.2	0.11-0.17	6.1-7.3	0-2	High	0.28			
	36-60	20-45	1.40-1.50	0.06-0.6	0.14-0.20	6.6-8.4	0-4	Moderate	0.37			
Mn	0-5	1-10	1.35-1.50	6.0-20	0.04-0.10	6.6-7.8	2-4	Low	0.17	5	2	2-6
Minnewaukan	5-60	1-5	1.40-1.70	6.0-20	0.04-0.12	7.4-8.4	2-4	Low	0.15			
Mz:												
Moritz	0-9	20-27	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	0-2	Low	0.24	5	4L	3-6
	9-54	20-35	1.25-1.35	0.6-2.0	0.15-0.19	7.4-9.0	0-2	Moderate	0.28			
	54-60	10-27	1.30-1.50	0.6-2.0	0.13-0.19	7.4-9.0	0-4	Low	0.28			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm		K	T		Pct
Mz:												
Lamoure	0-35	27-34	1.15-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-4	Moderate	0.28	5	4L	4-8
	35-60	20-34	1.20-1.35	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			
Oh	0-9	35-40	1.15-1.30	0.2-0.6	0.13-0.19	6.6-7.8	0-4	High	0.37	5	4	4-7
Oldham	9-44	35-45	1.25-1.40	0.06-0.2	0.14-0.20	7.4-8.4	0-4	High	0.37			
	44-60	20-40	1.30-1.50	0.06-0.2	0.14-0.20	7.4-8.4	0-2	Moderate	0.43			
Or	0-10	10-20	1.25-1.40	2.0-6.0	0.11-0.20	6.1-7.8	0-2	Low	0.20	3	5	.5-3
Orthents	10-60	0-5	1.60-1.80	6.0-60	0.03-0.06	7.4-8.4	0-2	Low	0.10			
Pa	0-18	27-40	1.20-1.30	0.2-0.6	0.18-0.22	6.1-7.8	0-2	Moderate	0.37	5	7	6-10
Parnell	18-38	35-60	1.20-1.30	0.06-0.2	0.13-0.19	6.1-7.8	0-2	High	0.37			
	38-60	35-45	1.20-1.40	0.06-0.2	0.11-0.19	6.6-8.4	0-2	High	0.43			
Pm	0-8	27-34	1.15-1.30	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28	5	4L	4-8
Playmoor	8-30	20-34	1.20-1.35	0.2-2.0	0.16-0.19	7.4-9.0	4-16	Moderate	0.28			
	30-44	20-34	1.20-1.35	0.2-0.6	0.14-0.17	7.4-9.0	4-16	Moderate	0.32			
	44-60	20-34	1.20-1.40	0.2-2.0	0.14-0.17	7.4-9.0	4-16	Moderate	0.28			
PoB:												
Poinsett	0-9	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	9-18	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	18-25	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	25-60	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
PsB, PsC:												
Poinsett	0-9	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	9-18	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	18-25	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	25-60	25-30	1.50-1.70	0.6-2.0	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Waubay	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-29	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	29-48	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	48-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
PwA, PwB:												
Poinsett	0-9	27-30	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-6
	9-18	20-32	1.20-1.35	0.6-2.0	0.18-0.21	6.1-7.8	0-2	Moderate	0.32			
	18-25	20-32	1.20-1.35	0.6-2.0	0.18-0.21	7.4-8.4	0-2	Moderate	0.43			
	25-60	25-30	1.50-1.70	0.6-2.0	0.16-0.19	7.4-8.4	0-8	Moderate	0.37			
Waubay	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
	14-29	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	29-48	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	48-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			
Ra	0-9	27-35	1.10-1.25	0.2-2.0	0.19-0.22	7.4-8.4	0-2	Moderate	0.28	5	4L	4-7
Rauville	9-60	20-45	1.10-1.30	0.2-0.6	0.17-0.20	7.4-8.4	0-4	Moderate	0.32			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
ReA, ReB	0-11	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low	0.28	3	6	2-4
Renshaw	11-17	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low	0.28			
	17-60	0-5	1.45-1.65	>20	0.03-0.06	6.6-8.4	0-2	Low	0.10			
RnC:												
Renshaw	0-11	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low	0.28	3	6	2-4
	11-17	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low	0.28			
	17-60	0-5	1.45-1.65	>20	0.03-0.06	6.6-8.4	0-2	Low	0.10			
Brandt	0-8	27-35	1.15-1.25	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	4	7	4-8
	8-32	25-35	1.20-1.35	0.6-2.0	0.17-0.21	6.1-7.8	0-2	Moderate	0.32			
	32-42	20-30	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	42-49	20-27	1.45-1.60	2.0-6.0	0.06-0.08	7.4-8.4	0-2	Low	0.24			
	49-60	5-10	1.60-1.75	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
RsC:												
Renshaw	0-11	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low	0.28	3	6	2-4
	11-17	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low	0.28			
	17-60	0-5	1.45-1.65	>20	0.03-0.06	6.6-8.4	0-2	Low	0.10			
Sioux	0-7	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low	0.15	2	5	1-3
	7-14	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low	0.15			
	14-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low	0.10			
SaD:												
Sioux	0-7	10-20	1.30-1.50	2.0-6.0	0.10-0.15	6.6-8.4	0-2	Low	0.15	2	5	1-3
	7-14	10-20	1.20-1.50	2.0-6.0	0.10-0.15	7.4-8.4	0-2	Low	0.15			
	14-60	0-10	1.60-1.70	6.0-60	0.03-0.06	7.4-8.4	0-2	Low	0.10			
Renshaw	0-11	20-26	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.8	0-2	Low	0.28	3	6	2-4
	11-17	18-27	1.30-1.45	0.6-6.0	0.11-0.18	6.6-8.4	0-2	Low	0.28			
	17-60	0-5	1.45-1.65	>20	0.03-0.06	6.6-8.4	0-2	Low	0.10			
So	0-6	27-40	1.10-1.40	0.2-0.6	0.18-0.23	6.6-8.4	2-8	Moderate	0.37	5	4L	5-20
Southam	6-42	35-50	1.20-1.50	0.06-0.2	0.14-0.20	6.6-8.4	2-8	High	0.28			
	42-60	18-50	1.20-1.50	0.06-0.6	0.13-0.17	7.4-8.4	2-8	High	0.28			
Sp	0-8	20-26	1.15-1.30	0.6-2.0	0.18-0.22	6.1-7.3	0-2	Low	0.24	4	6	4-8
Spottswood	8-26	18-30	1.25-1.40	0.6-2.0	0.18-0.22	6.6-8.4	0-2	Moderate	0.28			
	26-60	2-8	1.50-1.70	>20	0.03-0.06	7.4-8.4	0-2	Low	0.10			
StB	0-7	18-27	1.15-1.30	0.6-2.0	0.18-0.22	5.6-7.3	0-2	Low	0.24	4	6	3-6
Strayhoss	7-30	18-30	1.15-1.30	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	30-36	18-30	1.25-1.35	0.6-2.0	0.15-0.20	7.4-8.4	0-2	Moderate	0.43			
	36-60	5-10	1.40-1.60	6.0-20	0.06-0.10	7.4-8.4	0-2	Low	0.17			
To	0-18	18-39	1.00-1.50	0.6-2.0	0.18-0.23	5.6-7.8	0-0	Moderate	0.37	5	7	5-10
Tonka	18-45	35-45	1.40-1.65	0.06-0.2	0.14-0.19	5.6-7.8	0-2	High	0.43			
	45-60	18-39	1.40-1.70	0.2-0.6	0.14-0.19	6.6-8.4	0-4	Moderate	0.37			
VbA, VbB:												
Vienna	0-7	22-26	1.10-1.25	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low	0.28	5	6	3-8
	7-16	24-32	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	16-44	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	44-60	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Brookings	0-17	27-35	1.15-1.25	0.6-2.0	0.19-0.22	5.6-7.3	0-0	Moderate	0.28	5	7	4-8
	17-25	25-35	1.20-1.35	0.6-2.0	0.19-0.22	6.6-8.4	0-0	Moderate	0.32			
	25-32	25-35	1.20-1.35	0.6-2.0	0.17-0.20	7.4-8.4	0-0	Moderate	0.32			
	32-60	20-35	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	0-8	Moderate	0.37			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm		K	T		Pct
VnC:												
Vienna	0-7	22-26	1.10-1.25	0.6-2.0	0.20-0.22	6.1-7.3	0-0	Low	0.28	5	6	3-8
	7-16	24-32	1.20-1.35	0.6-2.0	0.17-0.20	6.1-7.3	0-2	Moderate	0.32			
	16-44	25-32	1.35-1.55	0.2-0.6	0.16-0.20	6.6-8.4	0-2	Moderate	0.37			
	44-60	20-32	1.50-1.70	0.2-0.6	0.16-0.20	7.4-8.4	2-4	Moderate	0.37			
Buse	0-7	18-27	1.40-1.50	0.2-0.6	0.17-0.22	6.6-8.4	0-0	Low	0.28	5	4L	1-3
	7-24	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
	24-60	18-35	1.55-1.65	0.2-0.6	0.14-0.19	7.4-8.4	0-0	Moderate	0.37			
Wa	0-14	27-35	1.35-1.45	0.6-2.0	0.19-0.22	6.1-7.3	0-2	Moderate	0.28	5	7	4-8
Waubay	14-29	20-35	1.35-1.45	0.6-2.0	0.18-0.21	6.6-7.8	0-2	Moderate	0.32			
	29-48	20-35	1.35-1.45	0.6-2.0	0.17-0.20	7.4-8.4	0-2	Moderate	0.43			
	48-60	20-35	1.40-1.50	0.6-2.0	0.16-0.18	7.4-8.4	0-4	Moderate	0.43			

Table 17.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
ArA Arvilla	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Ba Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
BaB Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
BbB, BbC:										
Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
BcD:										
Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Svea	B	None	---	---	3.0-5.0	Apparent	Apr-Jun	Moderate	High	Low.
BnA:										
Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Vienna	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
BrA, BrB Brandt	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Bs Brookings	B	None	---	---	3.0-5.0	Perched	Oct-Jul	High	High	Moderate.
BtD:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
BuC, BuE:										
Buse	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Barnes	B	None	---	---	>6.0	---	---	Moderate	High	Low.
BvD:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
BxE:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Langhei	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
ByC, ByD:										
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Ca Castlewood	C/D	Occasional	Long	Mar-Jun	0-1.5	Apparent	Oct-Jun	High	High	High.
Co:										
Colvin	C/D	None	---	---	+1-1.0	Apparent	Nov-Jul	High	High	Low.
Oldham	C/D	None	---	---	0.5-1.5	Apparent	Oct-Jun	High	Moderate	High.
Cu:										
Cubden	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
Cx:										
Cubden	C	None	---	---	1.5-3.5	Apparent	Apr-Jun	High	High	Low.
Tonka	C/D	None	---	---	+.5-1.0	Apparent	Apr-Jun	High	High	Low.
Dv Divide	B	Occasional	Brief	Apr-Jun	1.5-3.5	Apparent	Apr-Jun	Moderate	High	Low.
EgB:										
Egeland	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Embden	B	None	---	---	3.5-5.0	Apparent	Apr-Jun	Moderate	High	Low.
EmC:										
Egeland	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Maddock	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
EsA, EsB Estelline	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Fa Fairdale	B	Frequent	Brief	Mar-Jun	3.0-5.0	Apparent	Apr-Jun	Moderate	Moderate	Low.
FdA Fordville	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
FoB:										
Fordville	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
HeA, HeB Hetland	C	None	---	---	>6.0	---	---	Moderate	High	Moderate.
KrA, KrB:										
Kranzburg	B	None	---	---	>6.0	---	---	High	High	Moderate.
Brookings	B	None	---	---	3.0-5.0	Perched	Oct-Jul	High	High	Moderate.
La La Prairie	B	Occasional	Brief	Mar-Jun	3.5-5.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Ld LaDelle	B	Occasional	Brief	Apr-Jun	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
Lm Lamoure	C	Occasional	Brief	Mar-Jun	0-2.0	Apparent	Oct-Jun	High	High	Moderate.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Lr:										
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
Rauville	D	Frequent	Long	Mar-Oct	0-0.5	Apparent	Jan-Dec	High	High	Moderate.
Lw---------- Lowe	B/D	Occasional	Brief	Mar-Nov	0-1.5	Apparent	Jan-Dec	High	High	Low.
Ma---------- Marysland	B/D	Occasional	Brief	Apr-Sep	0.5-1.5	Apparent	Nov-Jul	High	High	Low.
MbA---------- Mauvais	C	None	---	---	1.0-3.5	Apparent	Apr-Mar	High	High	Low.
Mc:										
McIntosh	B	None	---	---	1.5-2.5	Apparent	Apr-Nov	High	High	Low.
Badger	C	Frequent	Brief	Mar-Oct	0-3.0	Perched	Oct-Jun	High	High	Low.
Mn---------- Minnewaukan	A/D	Occasional	Long	Apr-Jun	+.5-1.5	Apparent	Mar-Jul	Moderate	High	Low.
Mz:										
Moritz	C	Occasional	Brief	Mar-May	1.5-3.0	Apparent	Sep-Jun	High	High	Low.
Lamoure	C	Frequent	Brief	Mar-Oct	0-1.5	Apparent	Oct-Jun	High	High	Moderate.
Oh---------- Oldham	C/D	None	---	---	0.5-1.5	Apparent	Oct-Jun	High	Moderate	High.
Or---------- Orthents	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Pa---------- Parnell	C/D	None	---	---	+1-0.5	Apparent	Jan-Dec	High	High	Low.
Pm---------- Playmoor	C/D	Frequent	Brief	Mar-Jun	0-1.5	Apparent	Sep-Jun	High	High	High.
PoB:										
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
PsB, PsC:										
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
PwA, PwB:										
Poinsett	B	None	---	---	>6.0	---	---	High	High	Low.
Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.
Ra---------- Rauville	D	Frequent	Long	Mar-Oct	0-0.5	Apparent	Jan-Dec	High	High	Moderate.
ReA, ReB---------- Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
RnC:										
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Brandt	B	None	---	---	>6.0	---	---	High	Moderate	Low.
RsC:										
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
SaD:										
Sioux	A	None	---	---	>6.0	---	---	Low	Low	Low.
Renshaw	B	None	---	---	>6.0	---	---	Low	Moderate	Low.
So Southam	D	None	---	---	+5-1.0	Apparent	Jan-Dec	High	High	Low.
Sp Spottswood	B	Occasional	Brief	Mar-Jun	1.5-3.0	Apparent	Oct-Jun	Moderate	High	Low.
StB Strayhoss	B	None	---	---	>6.0	---	---	High	Moderate	Low.
To Tonka	C/D	None	---	---	+.5-1.0	Apparent	Apr-Jun	High	High	Low.
VbA, VbB:										
Vienna	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Brookings	B	None	---	---	3.0-5.0	Perched	Oct-Jul	High	High	Moderate.
VnC:										
Vienna	B	None	---	---	>6.0	---	---	Moderate	High	Moderate.
Buse	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Wa Waubay	B	None	---	---	3.5-5.0	Apparent	Oct-Jun	High	High	Low.

Table 18.--Classification of the Soils

Soil name	Family or higher taxonomic class
Arvilla	Sandy, mixed Udic Haploborolls
Badger	Fine, montmorillonitic, frigid Typic Argiaquolls
Barnes	Fine-loamy, mixed Udic Haploborolls
Brandt	Fine-silty, mixed Udic Haploborolls
Brookings	Fine-silty, mixed Pachic Udic Haploborolls
Buse	Fine-loamy, mixed Udorthentic Haploborolls
Castlewood	Fine, montmorillonitic, frigid Cumulic Haplaquolls
Colvin	Fine-silty, frigid Typic Calciaquolls
Cubden	Fine-silty, frigid Aeric Calciaquolls
Divide	Fine-loamy over sandy or sandy-skeletal, frigid Aeric Calciaquolls
Egeland	Coarse-loamy, mixed Udic Haploborolls
Embden	Coarse-loamy, mixed Pachic Udic Haploborolls
Estelline	Fine-silty over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Fairdale	Fine-loamy, mixed (calcareous), frigid Mollic Udifluvents
Fordville	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Hetland	Fine, montmorillonitic Pachic Udic Argiborolls
Kranzburg	Fine-silty, mixed Udic Haploborolls
LaDelle	Fine-silty, mixed Cumulic Udic Haploborolls
Lamoure	Fine-silty, mixed (calcareous), frigid Cumulic Haplaquolls
Langhei	Fine-loamy, mixed (calcareous), frigid Typic Udorthents
La Prairie	Fine-loamy, mixed Cumulic Udic Haploborolls
Lowe	Fine-loamy, frigid Typic Calciaquolls
Maddock	Sandy, mixed Udorthentic Haploborolls
Marysland	Fine-loamy over sandy or sandy-skeletal, frigid Typic Calciaquolls
Mauvais	Fine-loamy, mixed (calcareous), frigid Aeric Haplaquents
McIntosh	Fine-silty, frigid Aeric Calciaquolls
Minnewaukan	Mixed, frigid Typic Psammaquents
Moritz	Fine-loamy, mixed Aquic Calciborolls
Oldham	Fine, montmorillonitic (calcareous), frigid Cumulic Haplaquolls
Orthents	Orthents
Parnell	Fine, montmorillonitic, frigid Typic Argiaquolls
Playmoor	Fine-silty, mixed (calcareous), frigid Cumulic Haplaquolls
Poinsett	Fine-silty, mixed Udic Haploborolls
Rauville	Fine-silty, mixed (calcareous), frigid Cumulic Haplaquolls
Renshaw	Fine-loamy over sandy or sandy-skeletal, mixed Udic Haploborolls
Sioux	Sandy-skeletal, mixed Udorthentic Haploborolls
Southam	Fine, montmorillonitic (calcareous), frigid Cumulic Haplaquolls
Spottswood	Fine-loamy over sandy or sandy-skeletal, mixed Pachic Udic Haploborolls
Strayhoss	Fine-silty over sandy or sandy-skeletal, mixed Udic Haploborolls
Svea	Fine-loamy, mixed Pachic Udic Haploborolls
Tonka	Fine, montmorillonitic, frigid Argiaquic Argialbolls
Vienna	Fine-loamy, mixed Udic Haploborolls
Waubay	Fine-silty, mixed Pachic Udic Haploborolls

Interpretive Groups

Interpretive Groups

Soil name and map symbol	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
ArA Arvilla	IIIs-3	Shallow to Gravel	6	D2
Ba Badger	IIw-1	Loamy Overflow	2	A
BaB Barnes	IIe-2	Silty	3	F
BbB: Barnes	IIe-2	Silty	3	F
Buse	IIIe-6	Thin Upland	8	G
BbC: Barnes	IIIe-1	Silty	3	F
Buse	IVe-2	Thin Upland	8	G
BcD: Barnes	IVe-1	Silty	3	F
Buse	VIe-3	Thin Upland	8	G
Svea	IIe-1	Silty	1	K
BnA: Barnes	I-2	Silty	3	F
Vienna	I-2	Silty	3	F
BrA Brandt	I-2	Silty	3	F
BrB Brandt	IIe-3	Silty	3	F
Bs Brookings	I-3	Loamy Overflow	1	K
BtD: Buse	VIe-3	Thin Upland	8	G
Barnes	IVe-1	Silty	3	F
BuC, BuE: Buse	VIIs-1	Thin Upland	10	NS
Barnes	VIIs-1	Silty	10	NS
BvD: Buse	VIIe-1	Thin Upland	10	NS
Lamoure	VIw-1	Subirrigated	2	NS
BxE: Buse	VIIe-1	Thin Upland	10	NS
Langhei	VIIe-1	Thin Upland	10	NS
ByC: Buse	IVe-2	Thin Upland	8	G
Poinsett	IIIe-2	Silty	3	F

Interpretive Groups--Continued

Soil name and map symbol	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
ByD:				
Buse	VIe-3	Thin Upland	8	G
Poinsett	IVe-1	Silty	3	F
Ca	IVw-2	Wetland	10	B1
Castlewood				
Co:				
Colvin	IVw-3	Wetland	10	B1
Oldham	Vw-2	Wetland	10	B2
Cu:				
Cubden	IIs-4	Limy Subirrigated	1	F
Badger	IIw-1	Loamy Overflow	2	A
Cx:				
Cubden	IIs-4	Limy Subirrigated	1	F
Tonka	IVw-2	Wet Meadow	10	B2
Dv	IIIs-4	Limy Subirrigated	1	D1
Divide				
EgB:				
Egeland	IIIe-7	Sandy	5	H
Embden	IIIe-7	Sandy	1	H
EmC:				
Egeland	IVe-3	Sandy	5	H
Maddock	IVe-3	Sandy	5	H
EsA	IIs-3	Silty	6	D1
Estelline				
EsB	IIe-5	Silty	6	D1
Estelline				
Fa	VIw-1	Loamy Overflow	1	NS
Fairdale				
FdA	IIs-3	Silty	6	D1
Fordville				
FoB:				
Fordville	IIe-5	Silty	6	D1
Renshaw	IVs-2	Shallow to Gravel	6	D2
HeA	I-2	Silty	4	F
Hetland				
HeB	IIe-3	Silty	4	F
Hetland				
KrA:				
Kranzburg	I-2	Silty	3	F
Brookings	I-3	Loamy Overflow	1	K

Interpretive Groups--Continued

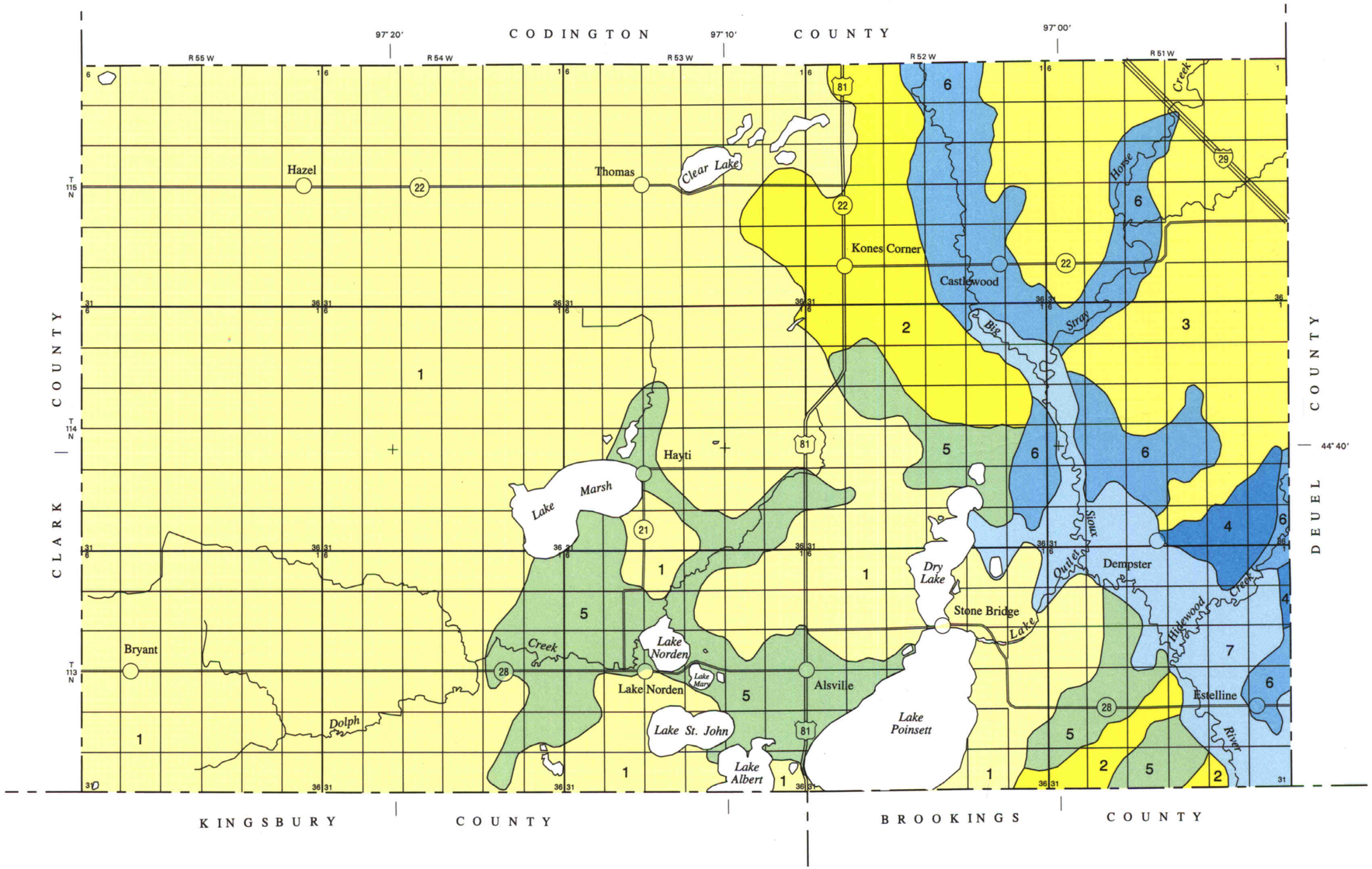
Soil name and map symbol	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
KrB:				
Kranzburg	IIe-3	Silty	3	F
Brookings	I-3	Loamy Overflow	1	K
La	I-1	Loamy Overflow	1	K
La Prairie				
Ld	I-1	Loamy Overflow	1	K
LaDelle				
Lm	IIIw-2	Subirrigated	2	A
Lamoure				
Lr:				
Lamoure	VIw-1	Subirrigated	2	NS
Rauville	Vw-1	Wetland	10	NS
Lw	IVw-3	Subirrigated	10	A
Lowe				
Ma	IVw-3	Subirrigated	10	B1
Marysland				
MbA	IVw-3	Subirrigated	10	A
Mauvais				
Mc:				
McIntosh	IIs-4	Limy Subirrigated	1	F
Badger	IIw-1	Loamy Overflow	2	A
Mn	IVw-1	Subirrigated	2	A
Minnewaukan				
Mz:				
Moritz	IIs-4	Limy Subirrigated	1	K
Lamoure	IVw-3	Subirrigated	2	B1
Oh	Vw-2	Wetland	10	B2
Oldham				
Or	VIIIs-1	Very Shallow	10	NS
Orthents				
Pa	Vw-2	Shallow Marsh	10	B2
Parnell				
Pm	IVw-4	Saline Subirrigated	10	J
Playmoor				
PoB:				
Poinsett	IIe-3	Silty	3	F
Buse	IIIe-6	Thin Upland	8	G
PsB:				
Poinsett	IIe-3	Silty	3	F
Buse	IIIe-6	Thin Upland	8	G
Waubay	I-3	Loamy Overflow	1	K

Interpretive Groups--Continued

Soil name and map symbol	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
PsC:				
Poinsett	IIIe-2	Silty	3	F
Buse	IVe-2	Thin Upland	8	G
Waubay	IIe-1	Silty	1	K
PwA:				
Poinsett	I-2	Silty	3	F
Waubay	I-3	Loamy Overflow	1	K
PwB:				
Poinsett	IIe-3	Silty	3	F
Waubay	I-3	Loamy Overflow	1	K
Ra	Vw-1	Wetland	10	B1
Rauville				
ReA	IIIs-3	Shallow to Gravel	6	D2
Renshaw				
ReB	IVs-2	Shallow to Gravel	6	D2
Renshaw				
RnC:				
Renshaw	IVe-4	Shallow to Gravel	6	D2
Brandt	IIe-3	Silty	3	F
RsC:				
Renshaw	IVe-4	Shallow to Gravel	6	D2
Sioux	VIs-3	Very Shallow	10	NS
SaD:				
Sioux	VIs-3	Very Shallow	10	NS
Renshaw	VIe-6	Shallow to Gravel	10	NS
So	VIIIw-1	Not Assigned	10	NS
Southam				
Sp	IIs-3	Loamy Overflow	1	K
Spottswood				
StB	IIe-2	Silty	3	F
Strayhoss				
To	IVw-2	Wet Meadow	10	B2
Tonka				
VbA:				
Vienna	I-2	Silty	3	F
Brookings	I-3	Loamy Overflow	1	K
VbB:				
Vienna	IIe-2	Silty	3	F
Brookings	I-3	Loamy Overflow	1	K

Interpretive Groups--Continued

Soil name and map symbol	Land capability classification	Range site	Windbreak suitability group	Pasture suitability group
VnC:				
Vienna	IIIe-1	Silty	3	F
Buse	IVe-2	Thin Upland	8	G
Wa	I-3	Loamy Overflow	1	K
Waubay				



N

SOIL LEGEND*

1	POINSETT-WAUBAY-BUSE ASSOCIATION
2	KRANZBURG-BROOKINGS ASSOCIATION
3	VIENNA-BROOKINGS ASSOCIATION
4	BARNES-VIENNA-BUSE ASSOCIATION
5	BRANDT-ESTELLINE ASSOCIATION
6	RENSHAW-FORDVILLE ASSOCIATION
7	LAMOURE-DIVIDE-LA PRAIRIE ASSOCIATION

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1992

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
in cooperation with the
SOUTH DAKOTA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

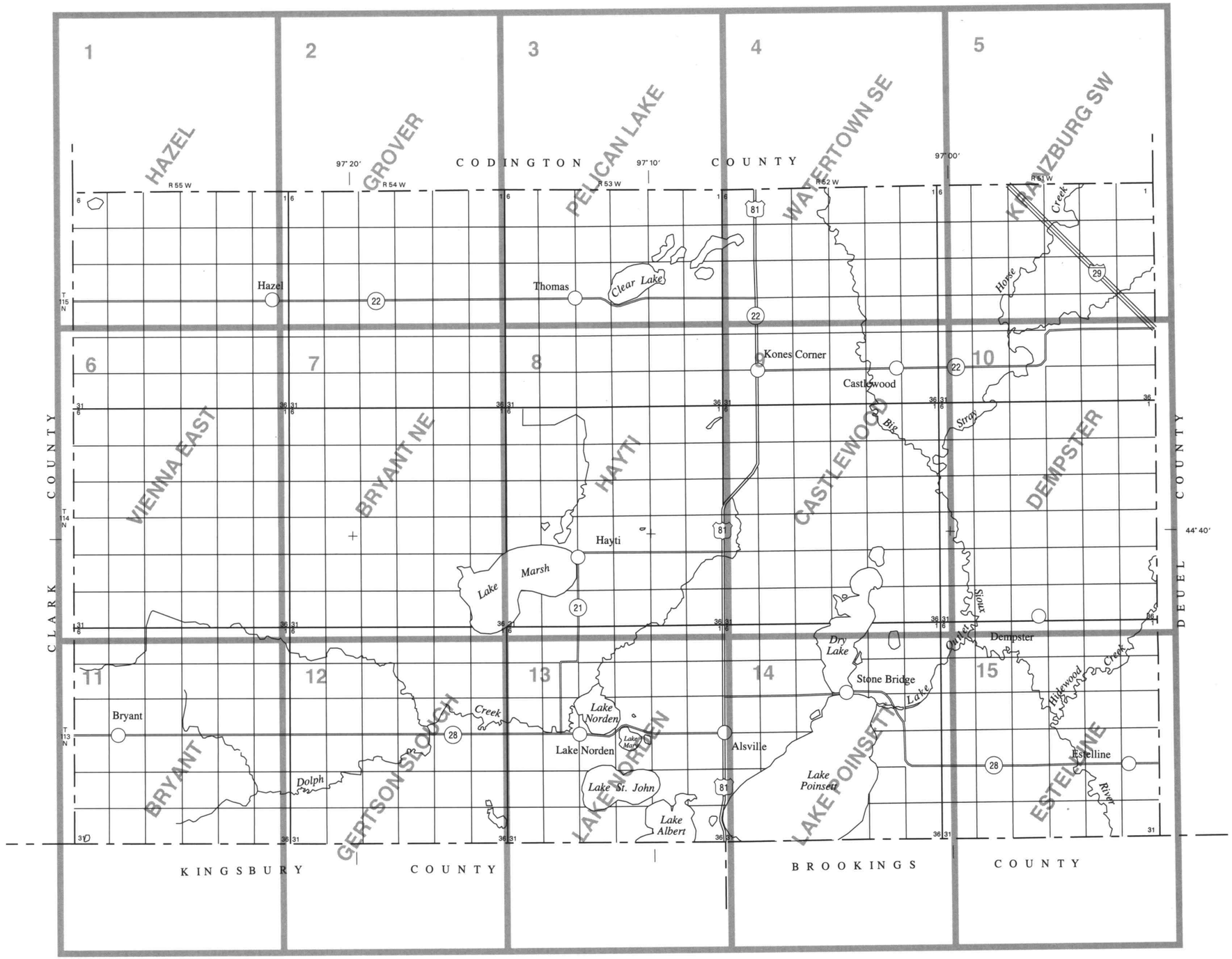
HAMLIN COUNTY, SOUTH DAKOTA

Scale 1:190080

1 0 1 2 3
MILES

1 0 1 2 3 4 5 6
KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

HAMLIN COUNTY, SOUTH DAKOTA

Scale 1:190080

1 0 1 2 3

MILES

1 0 1 2 3 4 5 6

KILOMETERS

SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial letter of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate slope phases. The second capital letter indicates the slope class. Symbols without a slope letter are for level or nearly level soils or for map units classified at higher taxonomic levels.

SYMBOL	NAME
Ara	Arvilla sandy loam, 0 to 2 percent slopes
Ba	Badger silty clay loam
BaB	Barnes clay loam, 2 to 6 percent slopes
BbB	Barnes-Buse loams, 2 to 6 percent slopes
BbC	Barnes-Buse loams, 6 to 9 percent slopes
BcD	Barnes-Buse-Svea loams, 2 to 15 percent slopes
BnA	Barnes-Vienna complex, 0 to 2 percent slopes
BrA	Brandt silty clay loam, 0 to 2 percent slopes
BrB	Brandt silty clay loam, 2 to 6 percent slopes
Bs	Brookings silty clay loam
BtD	Buse-Barnes loams, 9 to 20 percent slopes
BuC	Buse-Barnes loams, 2 to 15 percent slopes, very stony
BuE	Buse-Barnes loams, 9 to 40 percent slopes, very stony
BvD	Buse-Lamoure, channeled, complex, 0 to 40 percent slopes
BxE	Buse-Langhei complex, 15 to 40 percent slopes
ByC	Buse-Poinsett complex, 6 to 9 percent slopes
ByD	Buse-Poinsett complex, 9 to 15 percent slopes
Ca	Castlewood silty clay
Co	Colvin-Oldham silty clay loams
Cu	Cubden-Badger silty clay loams
Cx	Cubden-Tonka silty clay loams
Dv	Divide loam
EgB	Egeland-Embden complex, 2 to 6 percent slopes
EmC	Egeland-Maddock sandy loams, 6 to 9 percent slopes
EsA	Estelline silt loam, 0 to 2 percent slopes
EsB	Estelline silt loam, 2 to 6 percent slopes
Fa	Fairdale loam, channeled
FdA	Fordville loam, 0 to 2 percent slopes
FoB	Fordville-Renshaw loams, 2 to 6 percent slopes
HeA	Hetland silty clay loam, 0 to 2 percent slopes
HeB	Hetland silty clay loam, 2 to 6 percent slopes
KrA	Kranzburg-Brookings silty clay loams, 0 to 2 percent slopes
KrB	Kranzburg-Brookings silty clay loams, 1 to 6 percent slopes
La	La Prairie loam
Ld	LaDelle silt loam
Lm	Lamoure silty clay loam
Lr	Lamoure-Rauville silty clay loams, channeled
Lw	Lowe loam
Ma	Marysland loam
MbA	Mauvais clay loam, 0 to 2 percent slopes
Mc	McIntosh-Badger silty clay loams
Mn	Minnewaukan loamy sand
Mz	Moritz-Lamoure complex
Oh	Oldham silty clay loam
Or	Orthents, gravelly
Pa	Parnell silty clay loam
Pm	Playmoor silty clay loam
PoB	Poinsett-Buse complex, 2 to 6 percent slopes
PsB	Poinsett-Buse-Waubay complex, 1 to 6 percent slopes
PsC	Poinsett-Buse-Waubay complex, 2 to 9 percent slopes
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes
Ra	Rauville silty clay loam
ReA	Renshaw loam, 0 to 2 percent slopes
ReB	Renshaw loam, 2 to 6 percent slopes
RnC	Renshaw-Brandt complex, 3 to 9 percent slopes
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes
SaD	Sioux-Renshaw complex, 9 to 15 percent slopes
So	Southam silty clay loam
Sp	Spottswood loam
StB	Strayhoss loam, 2 to 6 percent slopes
To	Tonka silty clay loam
VbA	Vienna-Brookings complex, 0 to 2 percent slopes
VbB	Vienna-Brookings complex, 1 to 6 percent slopes
VnC	Vienna-Buse complex, 6 to 9 percent slopes
W	Water
Wa	Waubay silty clay loam

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

Field sheet matchline and neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK 1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

Divided (median shown if scale permits)

County, farm or ranch

ROAD EMBLEM & DESIGNATIONS

Interstate 173

Federal 287

State 52

DAMS

Large (to scale)

Medium or Small (Named where applicable)

PITS

Gravel pit

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban area) (occupied)

Church

School

WATER FEATURES

DRAINAGE

Perennial, single line

Intermittent

Drainage end

LAKES, PONDS AND RESERVOIRS

Perennial

LAKE POINSETT

MISCELLANEOUS WATER FEATURES

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS Ba Bs

MISCELLANEOUS

Gravelly spot 1/ < 4 acres

Sandy spot < 4 acres

Stony spot, very stony spot

1/ Includes areas less than 4 acres of Renshaw and Sioux soils.

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

HAZEL QUADRANGLE
SHEET NUMBER 1
7.5 MINUTE SERIES

This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

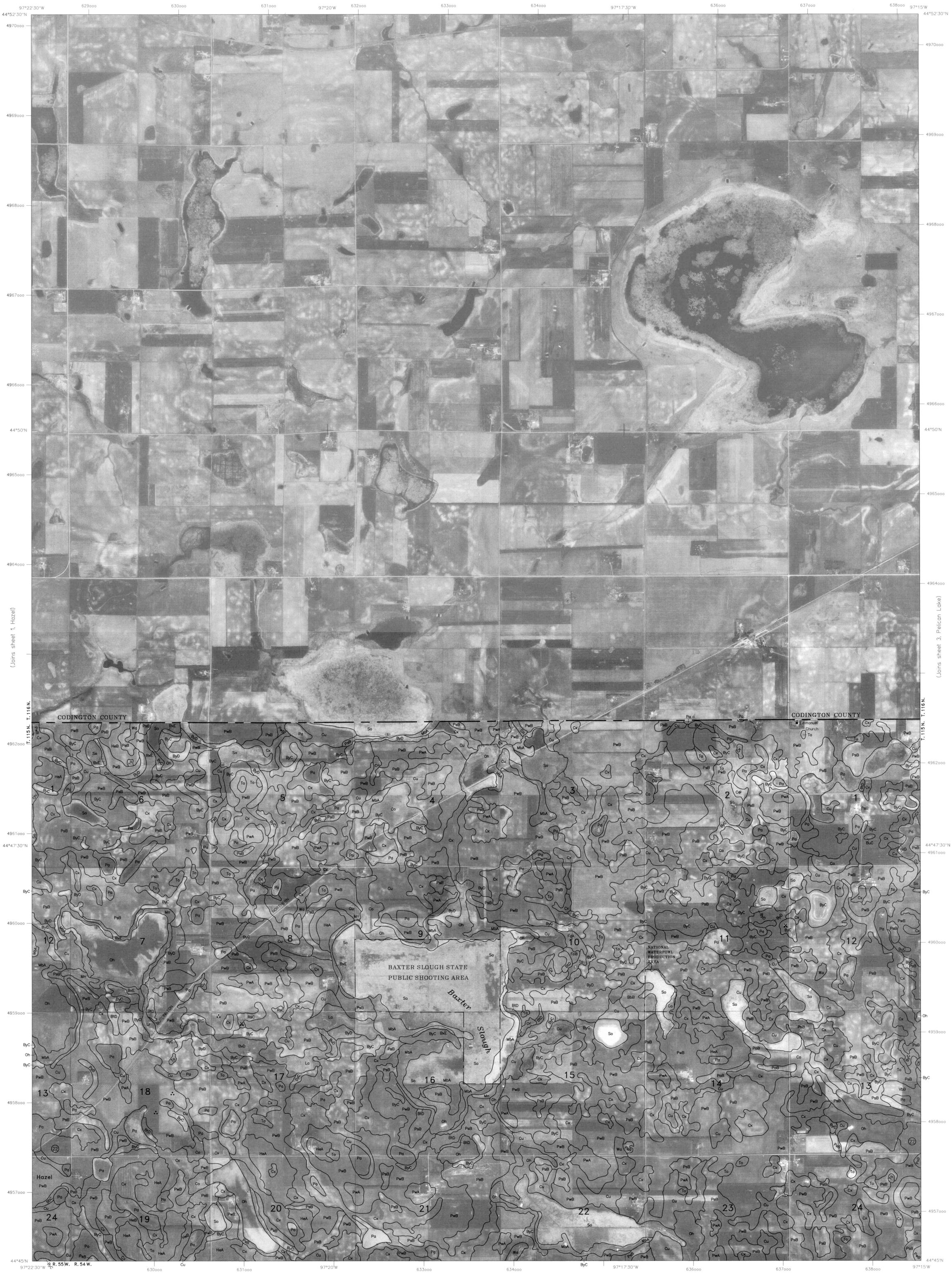
N

SHEET NUMBER 1 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
HAZEL QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

GROVER QUADRANGLE
SHEET NUMBER 2
7.5 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 2

N

SHEET NUMBER 2 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
GROVER QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

PELICAN LAKE QUADRANGLE
SHEET NUMBER 3
7.5 MINUTE SERIES

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 3

N

SHEET NUMBER 3 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
PELICAN LAKE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

WATERTOWN SE QUADRANGLE
SHEET NUMBER 4
7.5 MINUTE SERIES

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 4

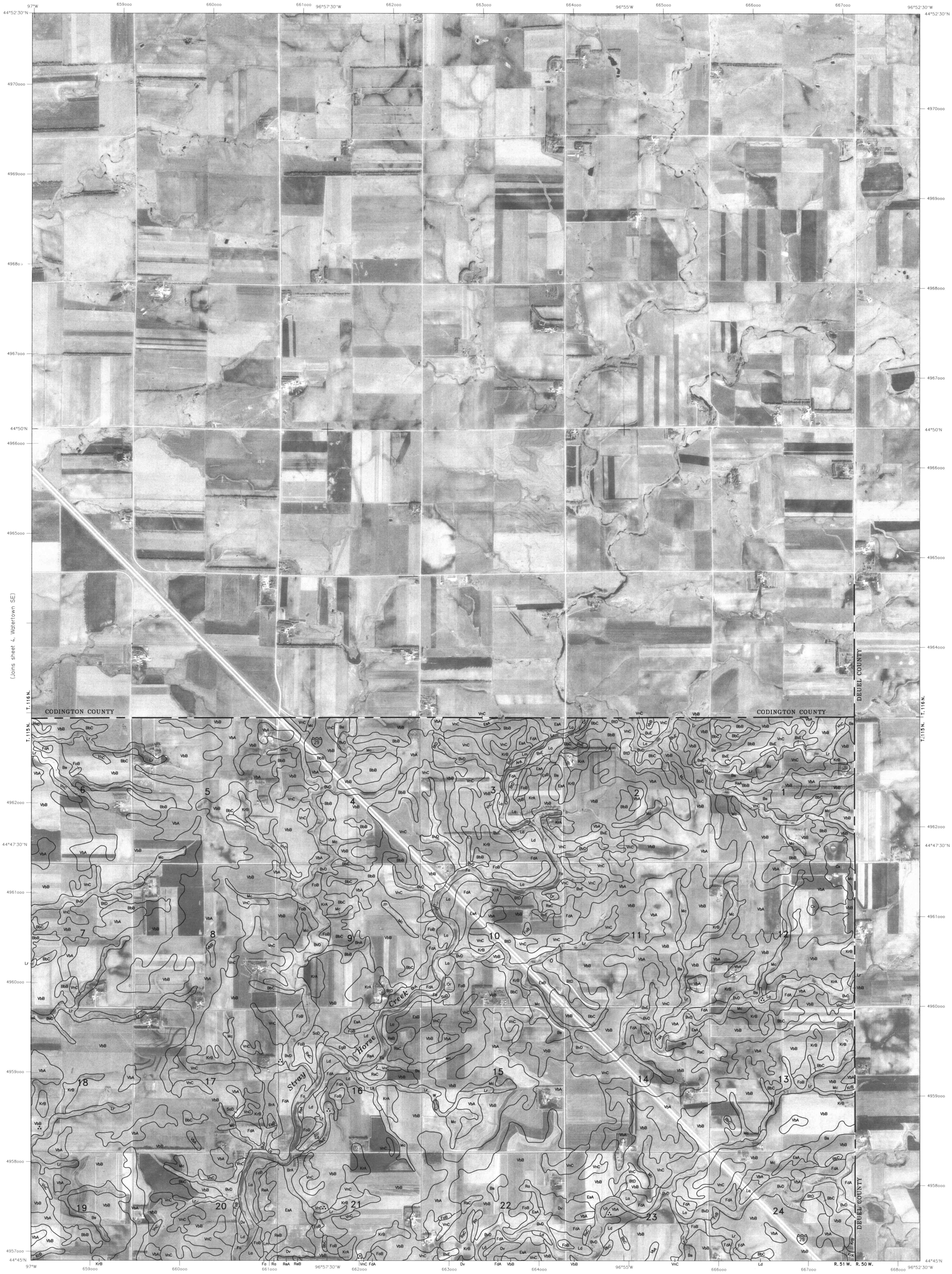
N

SHEET NUMBER 4 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
WATERTOWN SE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

KRANZBURG SW QUADRANGLE
SHEET NUMBER 5
7.5 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 5

N

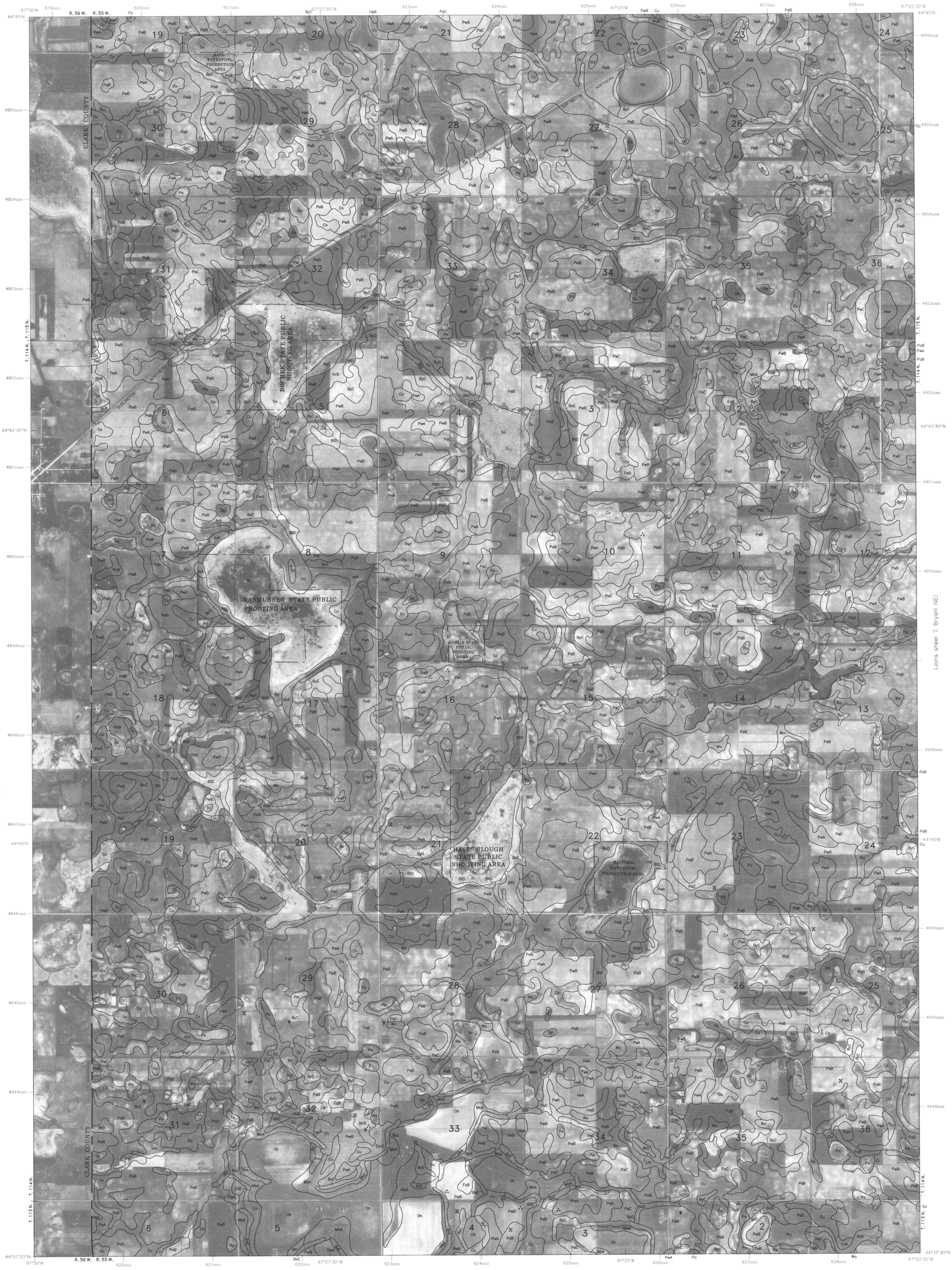
SHEET NUMBER 5 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
KRANZBURG SW QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

VIENNA EAST QUADRANGLE
SHEET NUMBER 6
7.5 MINUTE SERIES

(Joins sheet 1, Hazel)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 6

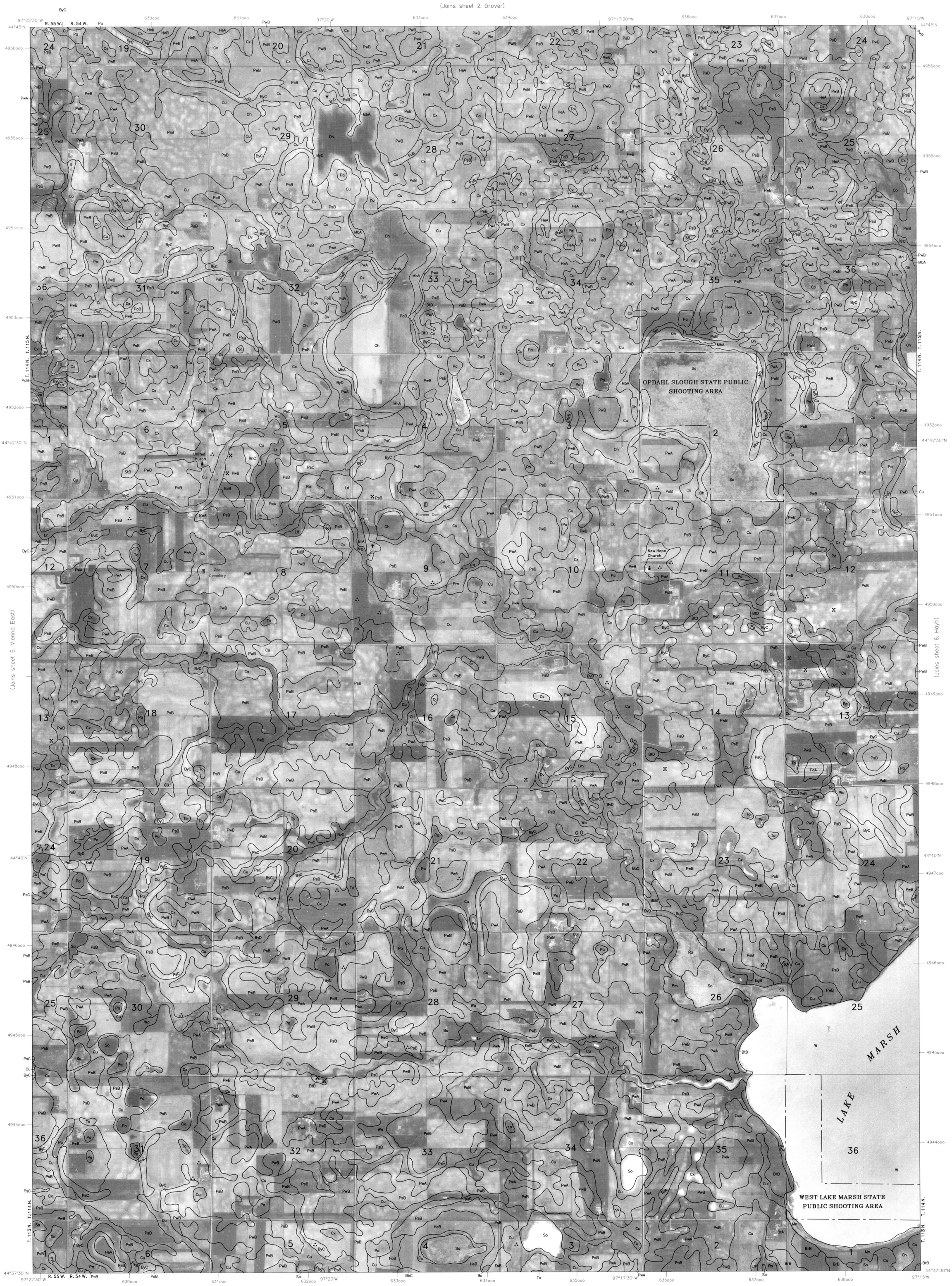
N

SHEET NUMBER 6 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
VIENNA EAST QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

BRYANT NE QUADRANGLE
SHEET NUMBER 7
7.5 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 7

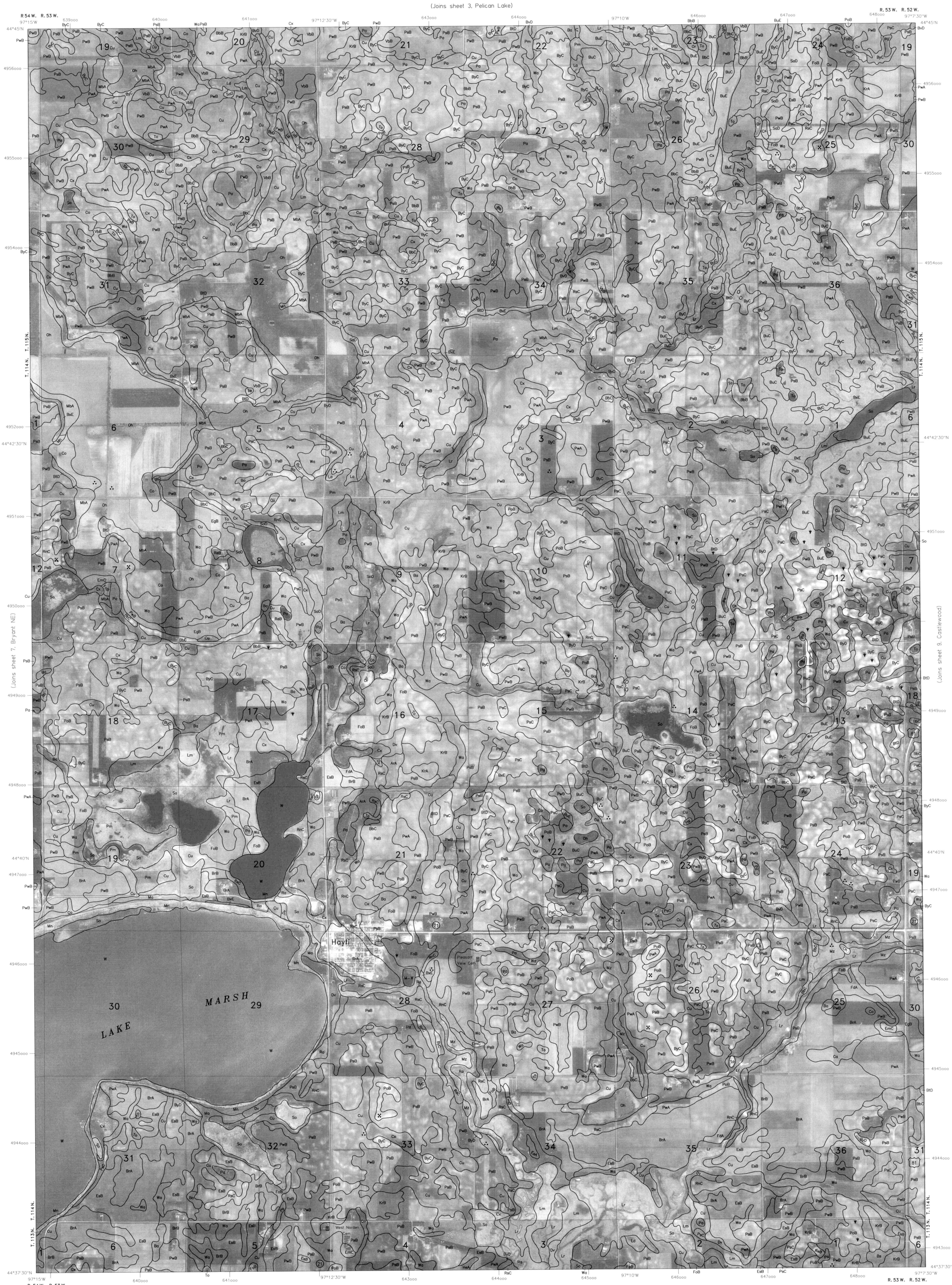
N

SHEET NUMBER 7 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
BRYANT NE QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

HAYTI QUADRANGLE
SHEET NUMBER 8
7.5 MINUTE SERIES



This soil survey map was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1991 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned. Digital soils data is available for this quadrangle.

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 8

N

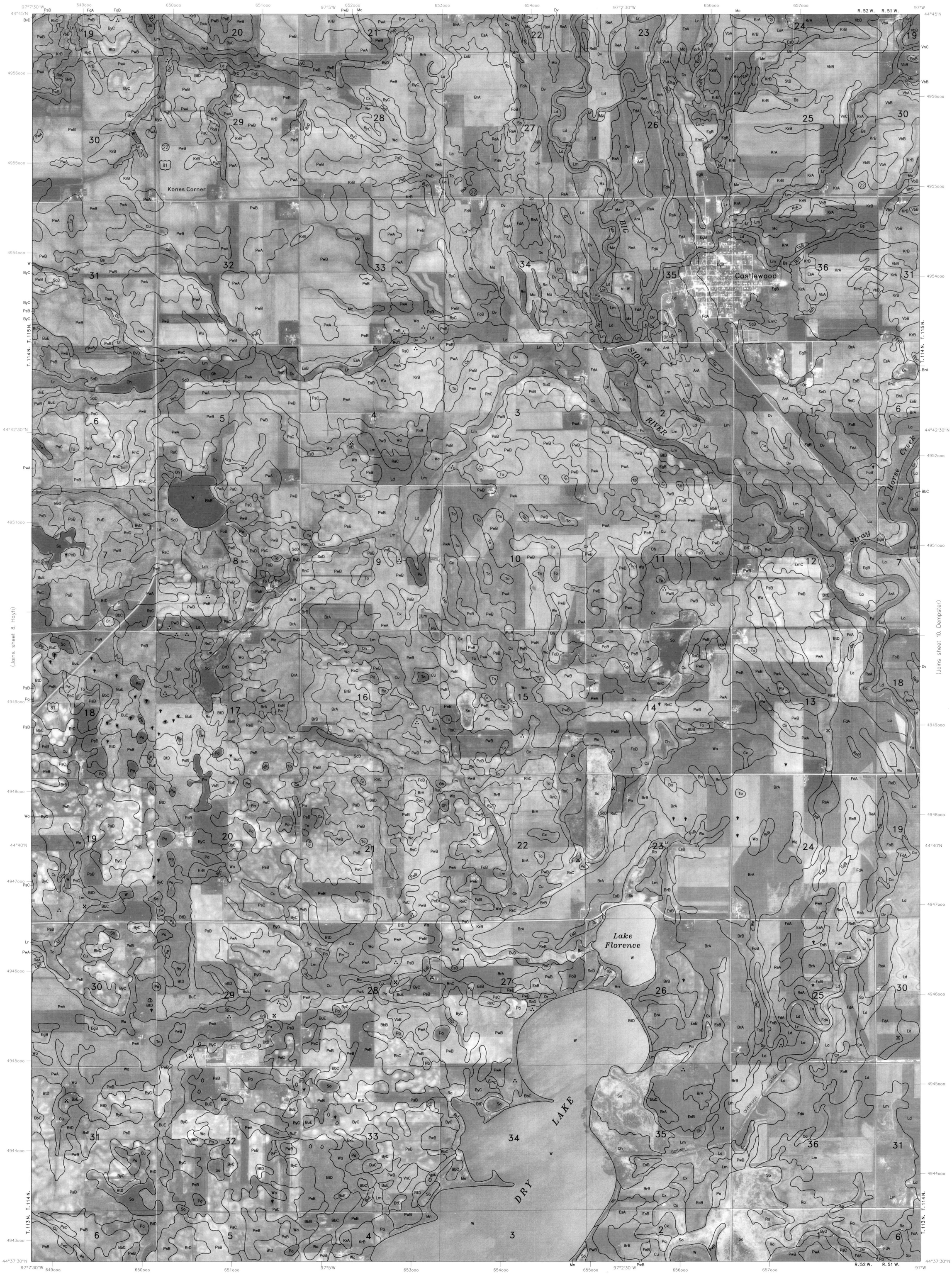
SHEET NUMBER 8 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
HAYTI QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

CASTLEWOOD QUADRANGLE
SHEET NUMBER 9
7.5 MINUTE SERIES

(Joins sheet 4, Watertown SE)



(Joins sheet 8, Hayti)

(Joins sheet 10, Dempster)

(Joins sheet 14, Lake Poinsett)

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 9

N

SHEET NUMBER 9 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
CASTLEWOOD QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

DEMPSTER QUADRANGLE
SHEET NUMBER 10
7.5 MINUTE SERIES

(Joins sheet 5, Kranzburg SW)

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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 10

N

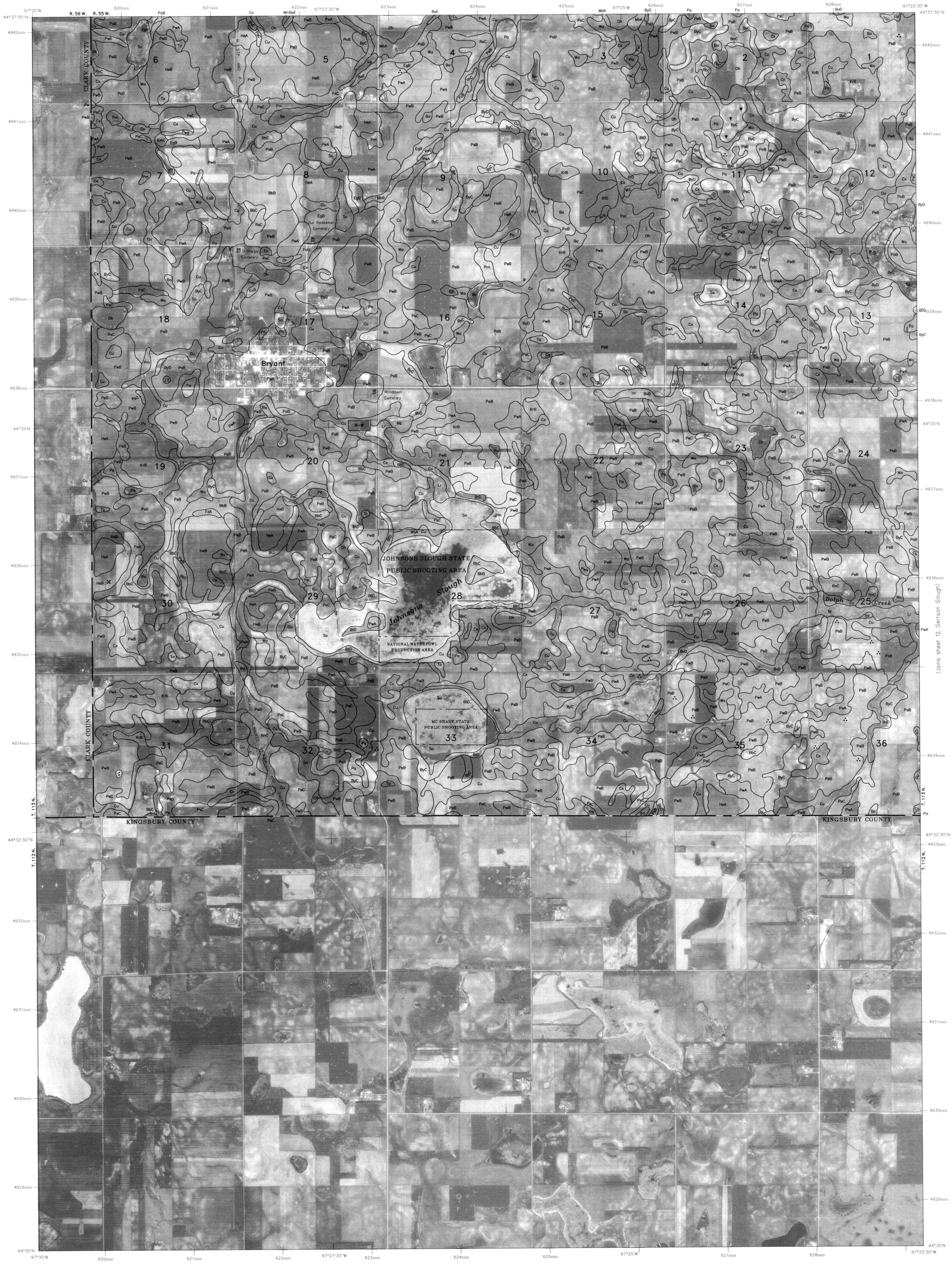
SHEET NUMBER 10 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
DEMPSTER QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

BRYANT QUADRANGLE
SHEET NUMBER 11
7.5 MINUTE SERIES

(Joins sheet 6, Vienna East)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 11

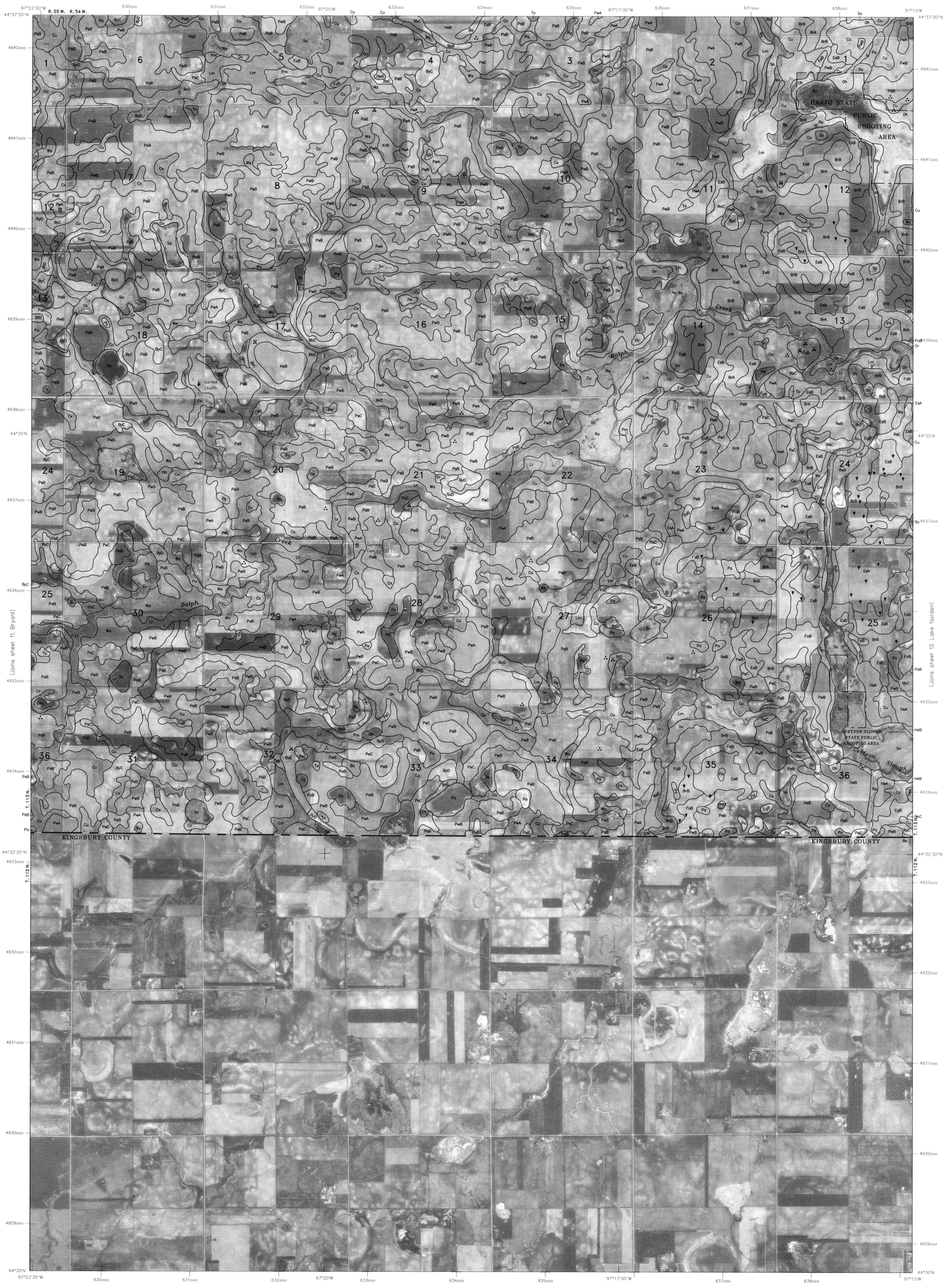
N

SHEET NUMBER 11 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
BRYANT QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

GERTSON SLOUGH QUADRANGLE
SHEET NUMBER 12
7.5 MINUTE SERIES



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 12

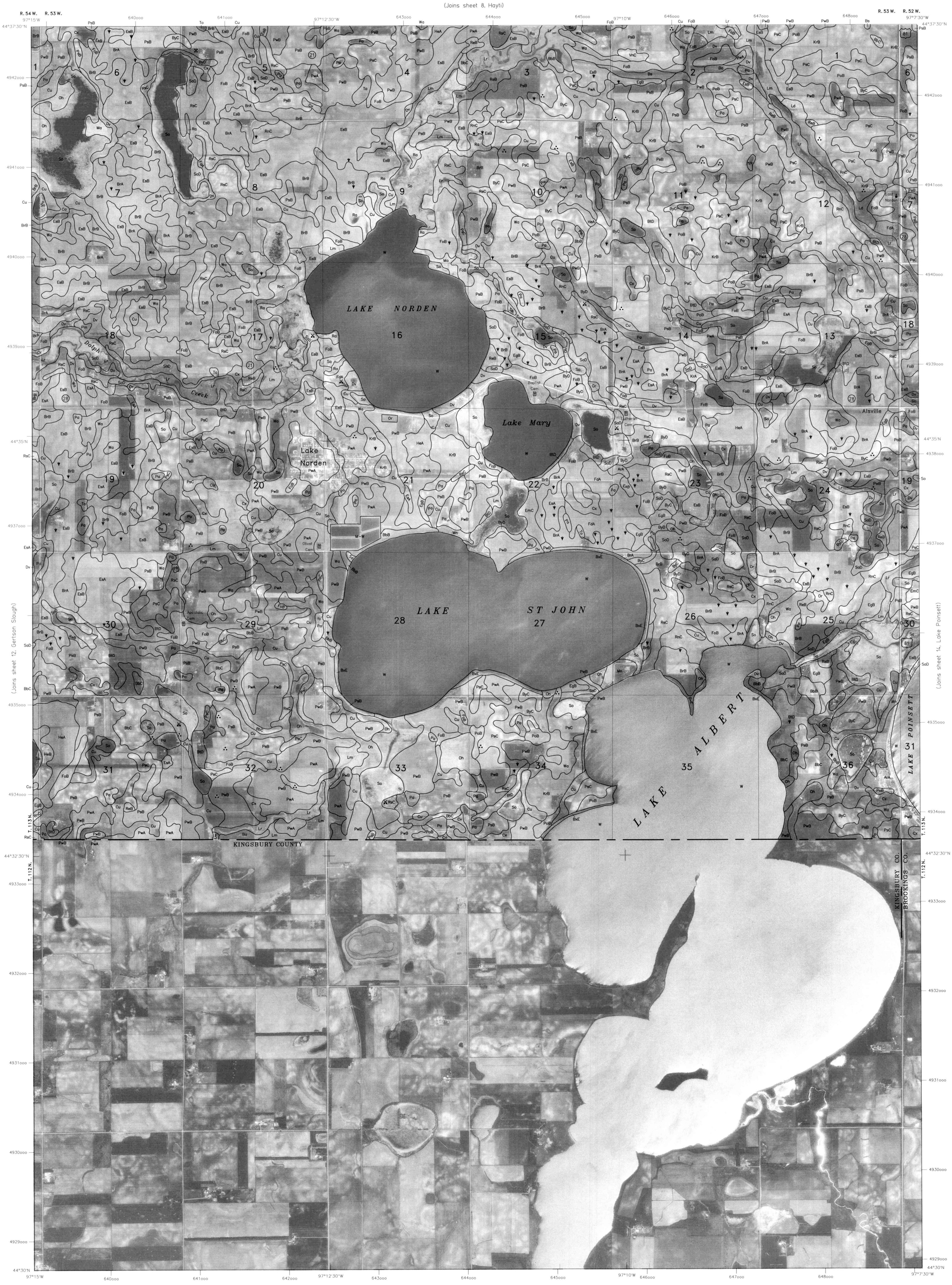
N

SHEET NUMBER 12 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
GERTSON SLOUGH QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

LAKE NORDEN QUADRANGLE
SHEET NUMBER 13
7.5 MINUTE SERIES



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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 13

N

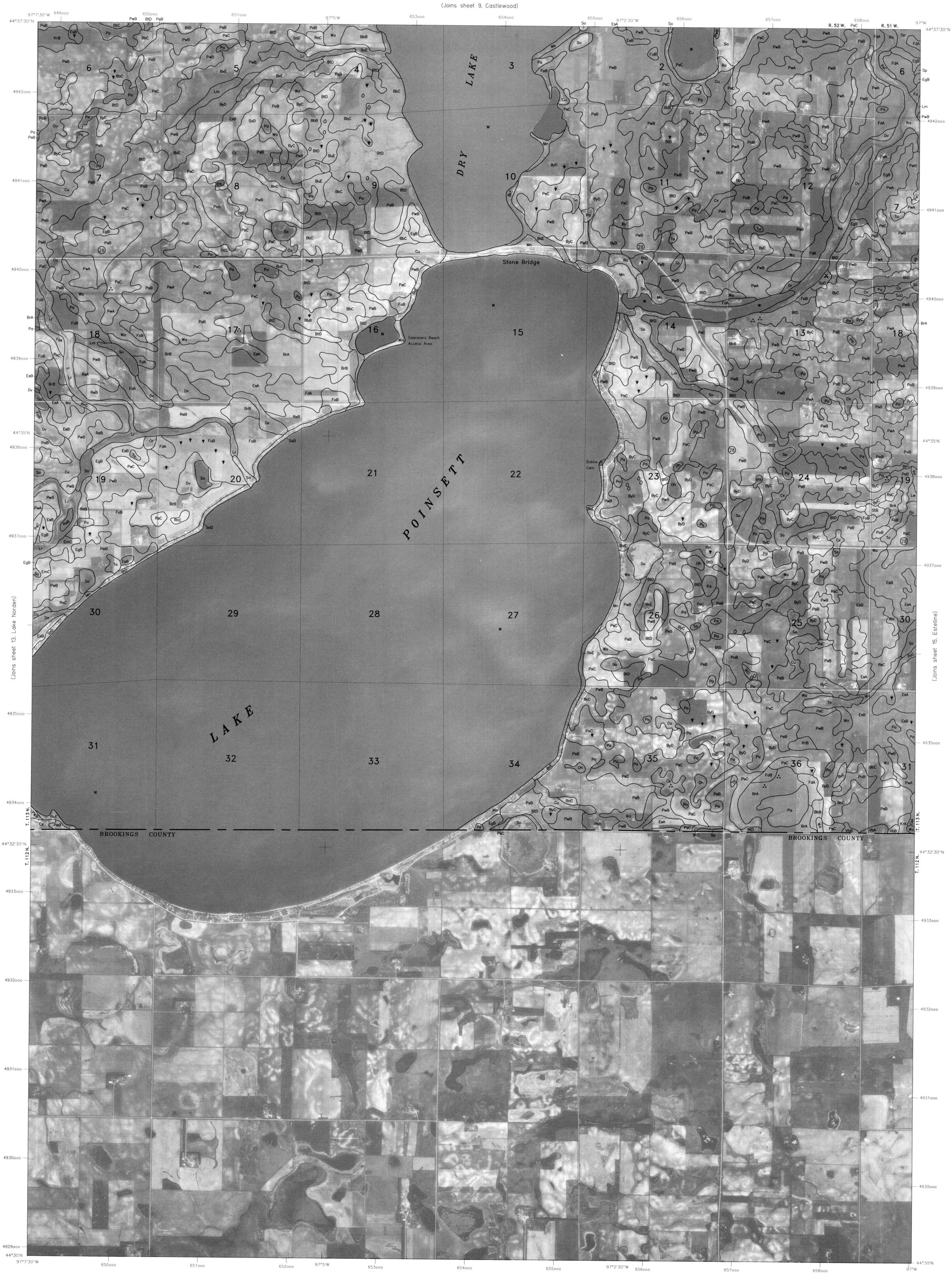
SHEET NUMBER 13 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
LAKE NORDEN QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

LAKE POINSETT QUADRANGLE
SHEET NUMBER 14
7.5 MINUTE SERIES

(Joins sheet 9, Castlewood)



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1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 14

N

SHEET NUMBER 14 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
LAKE POINSETT QUADRANGLE

UNITED STATES
DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

HAMLIN COUNTY, SOUTH DAKOTA

ESTELLINE QUADRANGLE
SHEET NUMBER 15
7.5 MINUTE SERIES

(Joins sheet 10, Dempster)

(Joins sheet 14, Lake Poinsett)

R. 51 W. R. 50 W.

DEUEL COUNTY

BROOKINGS COUNTY

T. 113 N.

T. 112 N.

Hidewood Creek

Bullhead Run

BIG SIOUX RIVER

Estelline

Estelline Municipal Airport

M-W

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1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

Scale 1:24000

Digital Data: UTM Coordinate System Zone: 14
Polyconic Projection
1927 North American Datum

HAMLIN COUNTY, SOUTH DAKOTA NO. 15

N

SHEET NUMBER 15 OF 15
HAMLIN COUNTY, SOUTH DAKOTA
ESTELLINE QUADRANGLE